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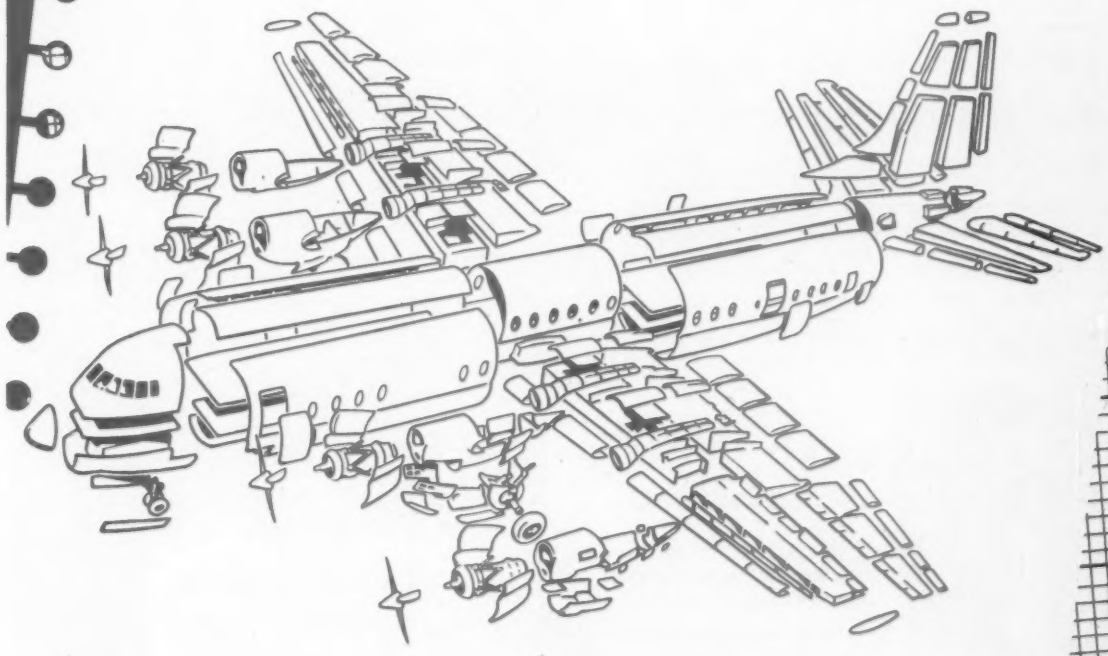

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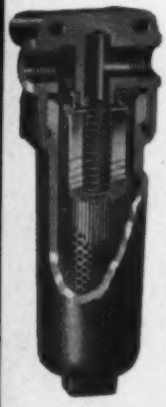

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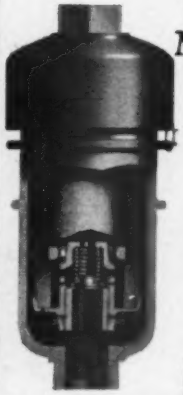

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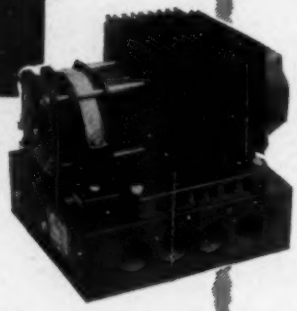

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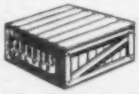

Insurance Spares to take care of aircraft operating in North America have already been sent to U.S.A. Similar support is being prepared for all British Aircraft operating on world air routes. Saunders world wide connections enable this linkage to be established and an Emergency Service is also in operation for the despatch of goods from London Airport to any part of the world within 48 hours.

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AP 386

THE AEROPLANE and ASTRONAUTICS

VOLUME 96 NUMBER 2489 MAY 15, 1959

Regenerating Enthusiasm

With that enthusiastic venturing after new things that characterizes the activities at Lasham where gather together a multitude of gliding clubs, a "Gliding Fair" has been added to the programme of this year's National Gliding Championships. What is more it is housed in a new hangar paid for out of club funds. There are some 20 exhibitors including one from Poland and one from France. Four gliders were sold on the opening day. And let it be emphasized this is all private venturing. There is no Government subsidy involved and indeed though the Services are competing in a friendly inter-Service rivalry, particularly the Army and the Navy, it is all very informal.

But all who were there on the perfect May afternoon, when the president of the Royal Aeronautical Society arrived in his own Chipmunk to declare the proceedings open, felt that the occasion might mark a new fusion of the disparate sides of aviation activity in this country. This fusion process has been brought about not by atomic energy but human enthusiasm.

We have already referred to the arrival of the president of the world's oldest aeronautical scientific society in his own light aeroplane. It was not without significance to see, prominent in the midst of the Glider Fair, one of Mr. Norman Jones' smart little Turbulent single-seaters. Another one owned by the secretary-general of the Air League was parked outside. Adjacently was parked the Tipsy Nipper.

Years ago, when the first gliding meeting at Itford had generated much enthusiasm this was deflected into the flying club movement which a far-sighted Air Ministry decided to foster and support by way of getting people interested in learning to fly.

Today, the gliding movement which regenerated itself in the early thirties has made so much progress that its finest pilots can put on shows in their motorless sailplanes that have been accepted as calculated to thrill the crowds at Farnborough. They can be seen racing their towing tugs past the stands with the towing ropes still attached and flying inverted for lengthy periods without power. Already a sailplane has flown the 358 miles to Edinburgh at an average speed of 55 m.p.h. Clearly there is no question of the present vigorous gliding movement being smothered by light aeroplanes.

What are to be welcomed are the signs of widening co-operation between the two fields. At the core, of course, is the hard fact that without glider tugs, such as the hard-worked Tigers and Prentice and Chipmunks, there would be no National Gliding Championships.

Nationalized Air Training

Some criticism has been made of the airline pilot training plan announced last week and described on p. 565 of this issue. One view is that the proposed programme does not go far enough as a training scheme in that training will be done on Chipmunks and Oxford aircraft.

The answer is that an extension of the training to include useful experience of the types flown in service would be uneconomic for the airlines, which would need to loan aircraft for the purpose, and the

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Annual Subscription Rate: United Kingdom £4 15 0
Overseas £5. Canada and U.S.A. $15.00

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training might, in any case, be premature so far as the pupil's experience is concerned.

Expensive modern airline aircraft need to have their use planned to the minute; conversion and route training can be done more satisfactorily and economically by the airlines themselves. Experience a dozen years ago, when the two airline corporations supported a major training unit at Aldermaston in a unique post-War situation, eventually demonstrated the weaknesses of a training unit of this kind.

One school of thought remains unconvinced by this argument and points out that by the time the graduates of the new College of Air Training are ripe for command, the airlines may well be operating airliners flying at three times the speed of sound. Protagonists of this way of thinking wish to see the new college equipped with jet trainers.

Then there are those who complain that the whole scheme is too expensive. Bearing in mind that graduates will have been taken straight from school the costly two-year university-type of training is probably a minimum requirement. A figure of £30,000 has been quoted as the cost of training an R.A.F. pilot.

Those who wonder why the new college is being considered at a time when many scores of airline pilots are digging in their gardens should remember that many pilots are nearing retiring age and that the full effect, even of the small first course, will not be felt until 1964 or later.

NEW PRESIDENT.—Mr. Peter Masefield, in the cockpit of his Chipmunk when, as the new President of the Royal Aeronautical Society, he arrived to open the National Gliding Championships at Lasham on May 9.

Eighty Sailplanes in Competition

THIS year's National Gliding Championships got off to a terrific start at Lasham on Sunday, May 10, with at least 6,500 miles of cross-country flying—over 4,500 miles by the 35 entries in League 1 and just under 2,000 miles by the 45 in League 2.

These figures included a new British distance and goal flight record of 358 miles by Cdr. Nicholas Goodhart, who also put up the first U.K. speed record for 500 kms. by flying from Lasham to the Scottish Gliding Union near Kinross in under 6½ hr. at 55 m.p.h. average; also a new British Women's distance record of 280 miles by Mrs. Anne Burns to Bellingham in North Sunderland, beating her previous record of 192 miles.

Tugging also provided new records. The 12 Tigers, 2 Messengers, 1 Prentice and 4 R.A.F. Chipmunks kept up a rate of one launch per 28 seconds for over an hour at the busiest period, taking every one to 2,000 ft. and by the end of the day had made 134 launches. This is believed to be a World's record, the previous best being 120 launches in one day at the 1956 World Championships in France.

As Mr. Peter Masefield said, when opening the Championships, there are just over 4,000 gliding pilots belonging to gliding organizations in Britain. Since 133 of them are flying in the Championships (47 in League 1 and 86 in League 2) the World's record number of 80 entries have each a ground crew of 2 or 3 in attendance, and many more are helping with the ground organization on the site, it follows that about 10% of the entire gliding population of the country is assembled at Lasham for the 10 days ending Whit-Monday.

Of the 80 entries, only six are of foreign manufacture. A two-seater Kranich and two examples of the Meise, the original form of the Olympia, were made in Germany, and there are two Polish Jaskolkas owned in England and Northern Ireland respectively, and a French Breguet 905, known as Fauvette, which is entered by the makers, as Cdr. Tony Goodhart, its pilot, is not yet its legal owner.

For many years Elliotts of Newbury have offered a cup for the best performance in the type of glider with the largest representation at the contests. Hitherto it has been the Olympia, but this year, while there are 17 of the Olympia's 1 and 2, there are also 17 of the Slingsby Skylark 3 and 3b, so what?

The World's first Glider Trade Fair, held at Lasham during the first week-end, proved a most successful innovation, and among the goods ordered on the opening day were four gliders.

Matters of Moment

Supersonic and Subsonic Airliners

SOME clarification of the position regarding British efforts towards production of a supersonic transport aircraft is afforded by two statements made on May 8. The Rt. Hon. Aubrey Jones, Minister of Supply, said:—

"Following the report by the Supersonic Transport Aircraft Committee, which under the chairmanship of the Royal Aircraft Establishment included chief designers and the senior technical representatives of airframe and aero-engine firms, I direct the Controller of Aircraft of the Ministry of Supply, Air Chief Marshal Sir Claude Pelly, K.C.B., C.B.E., M.C., A.D.C., to approach the individual companies concerned in order to obtain the views of their managements on the recommendation of this report.

"The views of the firms are being sought in particular on the extent of their interest in such a project, on their readiness to contribute to preparatory investigation and on the industrial organization which they consider appropriate to an undertaking of this magnitude. It will be left open to firms to give considered individual views on the type and speed of aircraft they would recommend."

The S.B.A.C. makes the following statement of policy:—

"The report . . . does not examine the economic or prestige aspects of a British airliner travelling at about Mach 2 in company with a possible foreign airliner travelling at Mach 3. It was also beyond the scope of the report to examine the impact of the project upon Government policy of support for the aircraft industry's work at large.

". . . It is necessary to define specific directions of effort. . . . First, there is investment in projects at subsonic speeds, where each project can be, and should be, judged primarily by the prospect it offers for sale of aircraft at home and abroad so as to achieve the fullest possible production lines and employment.

"Secondly, there is investment in projects which go into supersonic speeds, where the investment, judged by economic criteria, is less direct, though the indirect elements of research and development, and of prestige, are greater.

"We hope that it will be possible to pursue both directions of effort. It has to be recognized, however, that no aircraft firm could put risk capital into the development of supersonic airliners on the basis that it must recover costs and make a profit through sales to airlines. To the best of our knowledge, no American aircraft firm is venturing such risks, since the primary cost of development is being borne on account of military aircraft paid for by their Government.

"On the technical side nothing but good can come from active pursuit of the research and development problems . . . from the manufacturers' aspect the financial and economic considerations have not yet been studied. In our opinion, economic and further design studies must be done if the various factors are to be properly assessed.

"In the years which lie between the present and the time when supersonic transports become available it is almost certain that there will be further substantial buying by the airlines. Unless the British industry can obtain its share of those orders, the possibility of obtaining worth-while orders for supersonic transports will be seriously prejudiced. We are convinced that a determined drive in the subsonic field must be regarded as a necessity."

The Society Honours Achievement

ON the occasion of the 47th Wilbur Wright Memorial Lecture yesterday, R.Ae.S. awards were to be presented.

Three honorary Fellowships are made to:—

Professor J. Ackeret, Professor of Aerodynamics, Eidgenössischen Technischen Hochschule; Sir William Farren, C.B., M.B.E., M.A., D.Sc., F.R.S., M.I.Mech.E., Hon. F.I.A.S., F.R.Ae.S., technical director, A. V. Roe and Co., Ltd.; and S. B. Gates, O.B.E., M.A., F.R.S., F.R.Ae.S., chief scientific officer and consultant to the director of the R.A.E.

Honorary Companionships are awarded to:—

E. C. Bowyer, C.B.E., director and chief executive, S.B.A.C.; and Sir William Hildred, C.B., O.B.E., M.A., director-general, IATA.

The following medals are awarded:—

Silver Medal (for work of an outstanding nature in aeronautics)—Dr. E. A. Watson, O.B.E., D.Sc., Hon.M.I.Mech.E., director, Joseph Lucas (Gas Turbine Equipment), Ltd.

Bronze Medal (for work leading to an advance in aeronautics)—D. G. King-Hele, B.A., of the R.A.E.

British Gold Medal for Aeronautics (for outstanding practical achievement leading to advancement in aeronautics)—R. S. Stafford, C.B.E., F.R.Ae.S., technical director, Handley Page.

British Silver Medal for Aeronautics (for practical achievement leading to advancement in aeronautics)—D. J. Farrar, M.A., F.R.Ae.S., chief designer, guided weapons, Bristol Aircraft, Ltd., and N. H. Searby, Ph.D., M.I.E.E., manager, guided weapons research and development, Ferranti, Ltd.

Wakefield Gold Medal (for contributions towards safety in aviation)—K. A. Wood, superintendent-in-charge, Atomic Weapons Research Establishment, Ordfordness.

R. P. Alston Medal (for practical achievement associated with the flight testing of aircraft)—A. W. Bedford, A.F.C., A.R.Ae.S., chief test pilot, Hawker Aircraft, Ltd.

N. E. Rowe Medal (for the best lecture given before any Branch of the Society by a member of a Branch)—J. Dunham, M.A., G.I.Mech. E., Grad.R.Ae.S., Rolls-Royce, Ltd.

At the annual general meeting of the Society on May 7, the president, Sir Arnold Hall, presented the following:—

Simms Gold Medal, to R. P. Probert, deputy director, engine test facilities, N.T.G.E.; *George Taylor (of Australia) Gold Medal*, to H. L. Cox, N.P.L.; *Edward Busk Memorial Prize*, to T. R. F. Nonweiler, Department of Aeronautical Engineering, Queen's University, Belfast; *Orville Wright Prize*, to D. A. Spence, R.A.E.; *Herbert Ackroyd Stuart Memorial Prize*, to A. A. Lombard, director of engineering, aero-engine division, Rolls-Royce, Ltd.; *J. E. Hodgson Prize*, J. E. Allen, head of aerodynamics, project and assessment department, weapons research division, A. V. Roe and Co., Ltd.; *Branch Prize*, to B. D. Blackwell, engineering manager, Bristol Aero-Engines, Ltd.; *Navigation Prize*, to C. M. Cade, research department, Kelvin and Hughes, Ltd.; *Usborne Memorial Prize*, to Dr. J. S. Przemieniecki, Bristol Aircraft, Ltd.; and the *Pilcher Memorial Prize*, to A. W. Kitchenside, aircraft project office, Vickers-Armstrongs (Aircraft), Ltd.

FIRST PICTURES FROM LASHAM

Left: Lasham airfield photographed from a Tiger Moth tug. On the right is the encampment housing competitors, club building, control tents and canteen. The new hangar housing the Glider Fair is immediately behind the black hangar at the top of the photograph.

Above: The new Breguet Fauvette flown by Tony Goodhart.

Right: This view of the Glider Fair, taken from the Cellon stand, shows most of the other 20 exhibits.

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THE AEROPLANE
and ASTRONAUTICS

LONDON ARRIVAL.—Starting to-morrow, Aeroflot will be flying Tu-104As into London Airport twice a week on the service from Moscow and Copenhagen. More pictures and details are on pages 566-568.

Photograph copyright "The Aeroplane and Astronautics"

Matters of Moment . . . .

Viscount Templewood

SAMUEL JOHN GURNEY HOARE, 1st Viscount Templewood of Chelsea, died on May 7 in his 80th year.

Few people had so influential a connection with aviation. For two years, from 1922 to 1924, and again from November, 1924, to 1929, he was Secretary of State for Air. Immediately he took office his plans for the expansion of the R.A.F., laid down in conjunction with Trenchard, began to take shape so that the Service, which had been decimated after the First World War, would again be built up into a formidable fighting force.

His idea was that the force should be "a *corps d'élite*, highly trained, well equipped, and capable, so far as possible, of quick expansion." Despite unrealistic pacifist objections the R.A.F. was gradually built up, and the result was seen in the outcome of the 1939-45 War.

A significant appreciation of the value of an air force was seen in 1922, when the administration of Mesopotamia, now called Iraq, became the responsibility of the R.A.F. Sir Samuel Hoare, as he then was, had introduced the system of "control without occupation," by which recalcitrant tribesmen were controlled without the need for an army of occupation. With present stratagems the system is somewhat outdated, but for years the R.A.F. was able to keep the peace in the inflammable Middle East with negligible losses and little expense.

And it was not only in Service aviation that Hoare's methods proved to be well founded. At the end of 1926, along with Lady Maud Hoare, he flew to India in a D.H. Hercules of the youthful Imperial Airways, investigating the route and seeing for himself what were the special problems involved. It was the longest flight ever made by an Air Minister at that time.

After his service with the Air Ministry Sir Samuel was, for four years, Secretary for India; he was next at the Foreign Office; was First Lord of the Admiralty (in 1936-37, when the sea-going units of the Fleet Air Arm were handed over to the Navy), and in 1940 was again Air Minister.

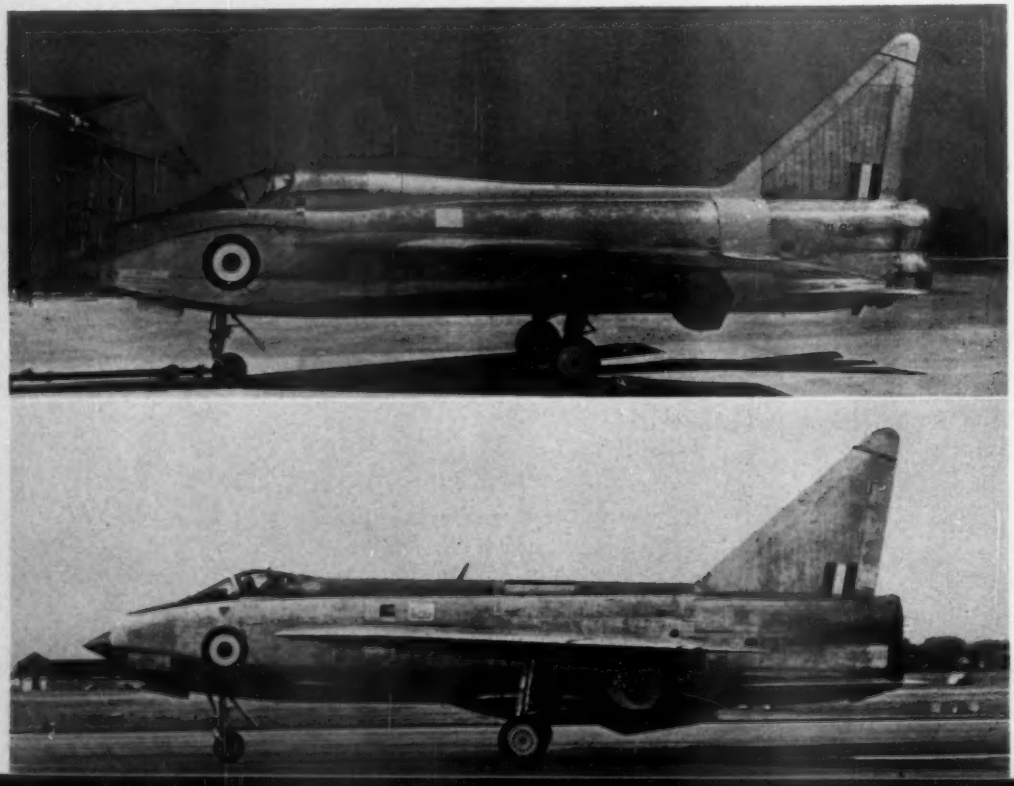
Viscount Templewood was a prolific writer and produced 10 books, primarily on aviation, including "India by Air," which set out the requirements of Empire air routes. In 1957 his "Empire of the Air" was published. From 1910 to 1944 he was M.P. (Cons.) for Chelsea.

Two at Mach 2?

THE two-seat version of the English Electric Lightning, the P.11, made a 30-min. first flight on May 6 from Warton aerodrome, flown by Wg. Cdr. R. P. Beamont, the company's chief test pilot. Fifteen minutes after take-off it flew at supersonic speed. This aircraft has been ordered in quantity for the R.A.F.; it is powered by two Rolls-Royce Avons with reheat.

The first two-seat Lightning is the first of a production batch of these aircraft rather than a prototype. It carries the same operational equipment as the single-seat fighter and has a similar performance. Although it has been produced as an operational trainer, it could clearly be developed as a first-line aircraft in its own right if in future the Lightning's radar and electronic equipment were to need more than a single pilot to operate it. This might well happen if an electronic countermeasures version of the Lightning were developed.

External differences between the two-seater and single-seater are obvious only around the cockpit, which has been widened considerably for side-by-side seating. The spine fairing at the rear of the cockpit is much larger than on the single-seat aircraft. Photographs of the two-seater suggest that every effort has been made to retain the favourable Area-ruling of the single-seater. This appears to have been done by reducing the fuselage cross-section behind and below the cockpit to compensate for the increased cross-sectional area of the larger canopy and of the spine fairing. Obviously the aim has been to minimize the performance loss to be expected in a side-by-side two-seat version of a Mach-2 fighter.



SIMILAR SILHOUETTE.—In side elevation, only minor differences can be detected between the new two-seat trainer version of the English Electric Lightning (top) and the original single-seat fighter (below).

Air Transport

Ensuring the Pilot Supply

LAST week's long-awaited announcement about the national college for airline pilots, to be set up at Hamble in the autumn of 1960, took our thoughts back to the immediately post-War years when the airline corporations shared the support for a training and conversion school at Aldermaston, Berkshire.

But, for better or for worse, there are big differences between the Aldermaston venture and the new College of Air Training. The former started life in March, 1946, as a B.O.A.C. training school and a year later, as Airways Training, became a school for both corporations until its closure in September, 1948. It was designed to bring a very large number of ex-Service pilots up to full operational capability on current transport aircraft. The new scheme is intended to take cadets through a two-year course from *ab initio* to basic commercial licence and instrument-rating standards.

It is, in fact, a thorough but somewhat expensive means of maintaining a supply of young pilots who will continue their route and type training up to first-officer standard with the airlines who have sponsored them and is somewhat similar to the scheme started by General Air Training 18 months ago (see THE AEROPLANE of November 22, 1957, p. 765).

The cost of a two-year course, excluding fees, accommodation and messing, will be approximately £4,000 for each pupil. The State will contribute a grant of £1,000 per pilot trained and the sponsoring airlines will therefore have to provide about £3,000. In appropriate cases the local education authorities may offer maintenance grants to pupils for the remaining costs of the course and the State will provide additional assistance to the college during the earlier stages of the plan. An entry age of about 18 is proposed.

The college will take over the present Air Service Training facilities and will be administered by a board of governors set up under a Trust Deed. Members of the board will be nominated by the two airline corporations (three from each), the Ministry of Transport and Civil Aviation and the Ministry of Education and will include an educational specialist and one representative of the independent operators.

For the first year the intake will consist of about 50 cadets. These, it is believed, will be sponsored mainly by B.O.A.C., with a small token sponsorship by the independent operators. B.E.A. does not expect to need aircrew replacements on the time-scale represented by the first-year intake. During the four following years, 1961-1965, a maximum of 110 cadets will be taken each year, so that from the autumn of 1963 there should be about 220 pupils at the college.

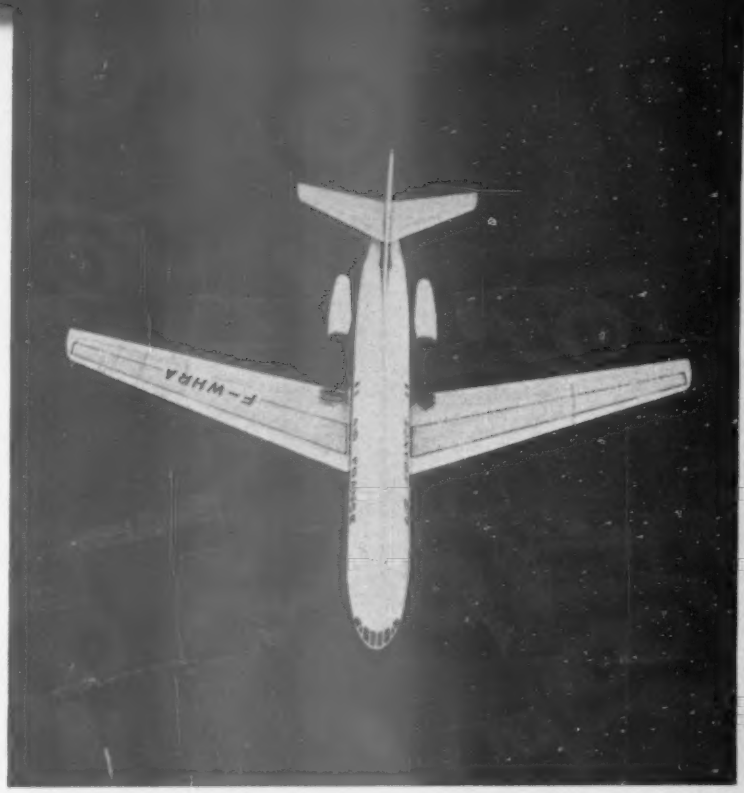
Caravelle in Service

WITH the introduction of the Sud-Aviation Caravelle into scheduled service this week, the French aircraft industry has achieved its most notable post-war success. The Caravelle becomes the fourth type of turbojet transport to go into service, after the Comet, Tu-104 and Boeing 707, and the second powered by Rolls-Royce Avons. The almost simultaneous introduction of a major new type by two international airlines—Air France and S.A.S.—is also noteworthy, if not unique.

Air France planned to fly their first Caravelle service on May 12, on the route from Paris to Athens and Istanbul. Four services a week go via Rome and three via Milan. On June 8 the Caravelle will appear on the Paris-London route (initially at a frequency of four times a week) and on the Nice-London route daily. Daily Paris-Rome and Nice-Rome services will start on June 15. All these services will be operated with mixed-class layouts, providing for up to 20 first-class passengers in the forward cabin.

The first regular S.A.S. Caravelle services were to start today, May 15, on European and Middle East routes out of Copenhagen. Cities to be served by Caravelle initially include Stockholm, Prague, Munich, Dusseldorf, Vienna, Athens, Istanbul, Damascus, Ankara, Cairo and Khartoum. Like Air France, S.A.S. will use a mixed-class interior, with 20 first-class and 50 tourist-class seats.

The Caravelle is the result of a specification issued in 1951 by the French Secretariat Général à l'Aviation Civile et Commerciale, calling for an aircraft able to carry a 15,500 lb. payload over 1,100 naut. miles at 350 knots. From the various proposals submitted, the S.E.210 was chosen for construction. When ordered, this design featured three Atar engines grouped in the rear fuselage; the present twin-Avon arrangement was adopted later.



INTERNATIONAL.—The Sud-Aviation Caravelle powered by Rolls-Royce, is now in service with Air France and S.A.S. on routes within Europe and to the Middle East.

Air France decided to buy the Caravelle on November 16, 1955, six months after the prototype had first flown, and a contract for 12 with an option on 12 more was signed on February 3, 1956; the option was taken up on July 10, 1958. The first production aircraft flew at Toulouse on May 18, 1958, by which time the two prototypes had amassed over 2,000 hours in the air. A French airworthiness certificate was awarded on April 2 this year—and F.A.A. certification, clearing the way for use of the Caravelle in the U.S.A., was obtained on April 8.

S.A.S. ordered the Caravelle in June, 1957, an initial order for 12 being later increased to 16, so that four can be leased to Swissair under the equipment interchange agreement concluded between the two airlines in October, 1958. Other airlines which have ordered the Caravelle to date are Varig of Brazil, 2; Finnair, 3; Air Algérie, 4, and Royal Air Maroc, 1.

In its initial production form the Caravelle has two 10,500 lb. s.t. Rolls-Royce Avon R.A. 29/1 Mk. 522 turbojets and is certificated at a gross weight of 96,000 lb. After the first batch of 35 aircraft to this standard, it is planned to substitute Avon R.A. 29/3 Mk. 527s which have higher-strength turbine blades for hotter operation and are rated at 11,400 lb. s.t. The gross weight is then expected to increase to 99,500 lb., and the cruising speed to 430 knots. Still later, there is the 12,200 lb. Avon R.A. 29/6 with an extra compressor stage; this is expected to allow the weight to go to 104,000 lb. and the cruising speed to 445 knots.

Mention has also been made of a Super Caravelle based on the Rolls-Royce R.B.141 by-pass turbojet under development for the Airco D.H.121, with a gross weight of about 110,000 lb.

Demonstrating the Herald

THE north-west frontier of India has been the scene of the most interesting of the demonstration flying during the Dart Herald's 18,000-mile tour of India and the Middle East. Leaving Blackbushe on April 10, the aircraft (G-OADF) flew to India by way of the Middle East and Pakistan making many demonstrations en route and at Delhi.

Carrying Indian Air Force and Indian Airlines personnel, the Dart Herald flew from Delhi to Srinagar, then across the Himalayas to Leh (10,500 ft. elevation) and subsequently visited Kargill (9,600 ft.) and Poonch near the Pakistan border. A supply-drop demonstration was made at Jorhat. In addition to Delhi and Calcutta, the Dart Herald has visited Bangalore, Colombo, Bombay, Sharjah, Teheran and Diyarbakir. After calls at Ankara, Athens and Rome it is expected back at Blackbushe on May 21.

THE AEROPLANE
and ASTRONAUTICS

Air Transport . . . .

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"The Aeroplane and Astronautics"

Above, with Fowler-type flaps extended, the Tu-104A approaches London Airport during a demonstration flight on May 7.

Left, a close-up of the captain's position. Some of the flight instruments have presentations which, though logical, are unusual to Western eyes, but the purposes of most of them are apparent after a few moments study.

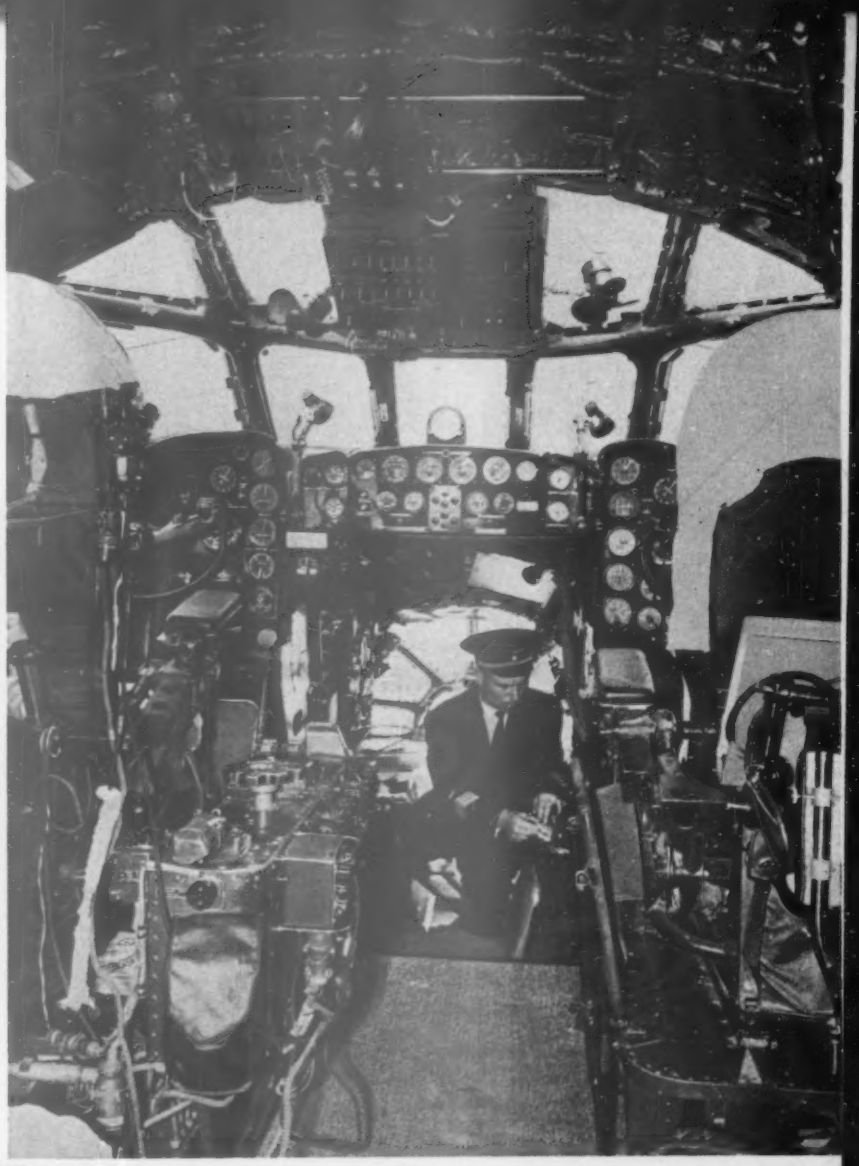
Above, part of the galley, with wood veneer finish, from which vodka and caviare were dispensed on the demonstration flight.

The navigator at his desk in the nose section into which are steps down from the flight deck proper.

Inside Russia's Jetliner

The Tu-104A at London Airport—*see page* 568

Above, a folding table is provided only for the front seat rows in the rear cabin. Individual coat hangers are numbered to correspond with the seats: coat storage is at the rear.



Above, the two positions of the captain and the first officer in the Tu-104A are separated, with the basic power and trimming controls on their left and right respectively. A flight engineer occupies a jump-seat between the two pilots. The powerplant instruments are in the central panel and the fuel controls are above the central screen panel. The layout of the flight deck is, in fact, similar to that of the B-29.

Below, the rear cabin of the Tu-104A seats 54 five-abreast; the seat pitch is about 39 inches, comparing favourably with Western tourist-class standards.

Air Transport . . . .

Aeroflot Comes to London

TOMORROW, May 16, Aeroflot will be operating its first scheduled service from Moscow to London and back, via Copenhagen. The first service by B.E.A. over the same route was leaving London on May 14. These flights inaugurate the reciprocal service between London and Moscow which was agreed in principle between the two Governments as long ago as December 19, 1957. Since then, M.T.C.A. objections to the noise level of the Tu-104 have been the primary reasons for the delay in making a start. The Ministry has still not explained precisely what Aeroflot has now done to the Tu-104 to allow it to meet the requirements.

Both airlines are providing two services a week in each direction. With Aeroflot using 70-seat Tu-104As and B.E.A. using 59-seat Viscount 806s, a theoretical total of 258 seats will be offered each way each week—far in excess of possible traffic demands, even allowing for a fairly frequent exchange of trade, technical and cultural missions and for diplomatic travellers. One presumes, therefore, that this route is highly regarded for prestige purposes by both Governments.

London is the 12th foreign capital added to the route network of Aeroflot, all now served by Tu-104As from Moscow. Tupolev's twin-jet transport, which has been in regular passenger service since September 15, 1956, also flies on routes from Moscow to another dozen major cities within the U.S.S.R.—Aeroflot claim Tu-104 services to "25 capitals," including cities in Mongolia and other Soviet States. The original 50-seat Tu-104s, with their Victorian drawing-room interiors, are now used only domestically, and the "stretched" 100-seat Tu-104B is beginning to come into service.

Last week, a Tu-104A came to London Airport on a proving flight, for crew familiarization at London and at the two principal diversion airports, Stansted and Prestwick. All Aeroflot flights into Britain will, incidentally, have a B.E.A. interpreter in the cockpit on the sector from Copenhagen; similarly, B.E.A. will pick up Russian interpreters for the flight to Moscow. Scheduled flying time by Tu-104A is 3 hr. 30 min.; the Viscount will take about 6 hr. 30 min.

At the invitation of Aeroflot, we were able to make a short trip in this Tu-104A, which made two demonstration flights on May 7. In command of the flight crew of six was Capt. P. Soldatov; the Tu-104A carried three pilots, a navigator, a radio operator and a flight engineer.

Passenger impressions of a flight in a C.S.A. Tu-104A were published at length in THE AEROPLANE for April 4, 1958, with additional notes in the issue for November 14. The Aeroflot aircraft which visited London differed in no obvious respects from that previously described; the layout with a forward 16-seat "first-class" cabin and a rear 54-seat "tourist-class" cabin separated by a spacious galley is apparently standard for the type—as are the cabin appointments, which are somewhat pedestrian, and the décor, which is dull by Western standards.

But the thing which impressed us most was not any minor shortcomings of the aeroplane or airline, but the way in which Russian civil aviation, so recently emancipated, is catching up with the West. A year or two ago, it was difficult for a journalist so much as to approach a Tu-104A; now, here were reporters and photographers welcomed aboard for a flight, while the three English-speaking stewardesses struggled smilingly, in best Western airline fashion, to dispense in turn barley sugar, vodka, Georgian white wine, coffee, cakes and cigarettes on a 50-minute flight.

The Aeroflot timetable, too, is revealing. A wholly-English edition now details Aeroflot international services together with those of 16 other airlines serving Russian cities. The general information in this timetable shows that Aeroflot now accepts such refinements as a no-show penalty (25% of the single fare up to a maximum of 280 roubles) and re-confirmation of onward bookings. It is obvious that Aeroflot is trying very hard indeed to match the World's airlines in reliability, service, and general *modus operandi*.

We noticed during the flight that strategically placed windows make it possible to observe the leading edges of all surfaces, including the tailplane and fin, presumably to check for icing. An unusual pre-take-off check (the result of an accident?) is made by one of the flight crew to ensure that the rear entrance door and all emergency exits are secure. The cabin cooling system seemed inadequate, the lowest cabin temperature during the flight being 25° C. (77° F.). Considerable noise, and some vibration, was apparent at the rear of the cabin, but forward the Tu-104A is as quiet and smooth as its jet contemporaries. It appears to handle easily and respond smoothly to control movements.

A few facts and figures are worth recording in confirmation of those previously published. The gross weight was quoted as 74,500 kg. (164,145 lb.) and the speed from 800-1,000 km./hr. (432-540 knots) cruising between 8,000 and 10,000 m. (26,250-32,800 ft.). Landing speed was quoted at 240-300 km./hr. (130-162 knots) and landing run 1,200-1,300 m. (3,937-4,265 ft.). The engines are 9,500 kg. (20,950 lb.s.t.) RD-3s.—F.G.S.

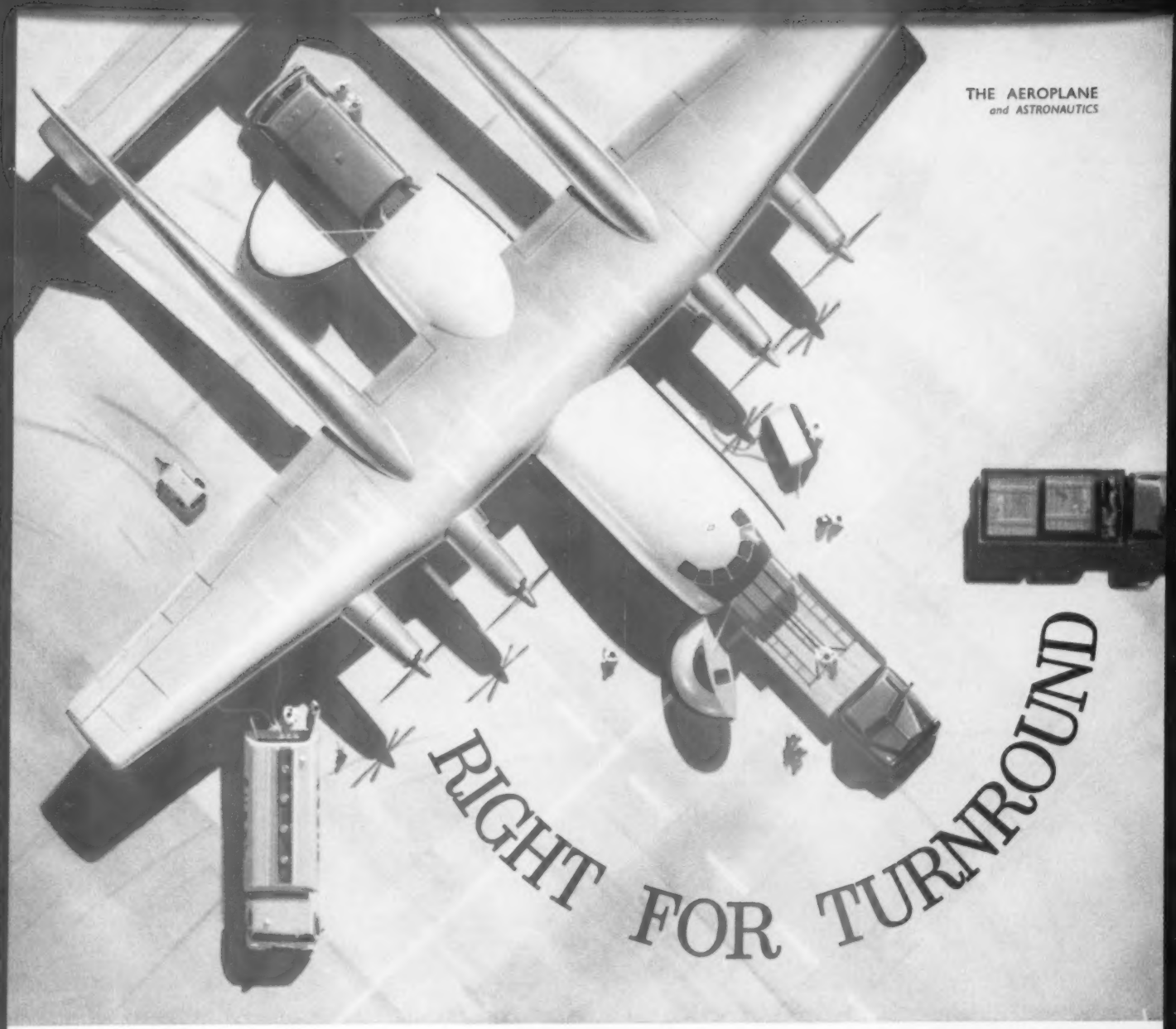
Making It More Difficult

IT is unhappily paradoxical that air transport, which is the least physically fettered of any means of conveyance, should be so heavily restricted by the effects of inter-tribal and inter-company jealousies. Not only are fares and rates prevented, by international agreement and by the very nature of a heavily State-capitalized transport system, from reaching their natural levels, but all manner of restrictive practices are carried on behind the scenes.

By now the average member of the public is fairly well aware that, given the proper use, by efficient smaller operators, of the written-down piston-engined transports which the big airlines are now discarding, an altogether lower level of fares would be both practicable and economically sound. He knows, too, that the prospects for lower fares have temporarily been killed by over-rapid re-equipment in the airlines' race to keep up with the Joneses—but hopes despairingly that the new, and theoretically more efficient, equipment may eventually make such lower fares possible. He is even vaguely aware that the real trouble is that air transport has been unfortunate enough to have grown up in an environment which favours the monopoly and often the State monopoly.

(*Continued on page 569*)

TEST DEMONSTRATION.—Seen here at London Airport, the second production Vickers Vanguard (G-APEA) made its first public appearance and first flight abroad on May 6, covering the 940 st. miles to and from Hamburg in a total flying time of 2 hr. 33 min.—thus averaging about 375 m.p.h. The flight was made to demonstrate the Vanguard at Hamburg Airport's "Overseas Day," but the aircraft carried its full test instrumentation and flight test observers.



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The less you handle cargo the cheaper the transport operation. This is true particularly of air freight where quick turnround is essential if costs are to be kept to a minimum. With the Argosy (AW650) a loading system is being developed that will enable the huge freight hold to be cleared and filled again in a few minutes. With full-width doors at either end of the fuselage, the load can be discharged at one end while new cargo is being loaded at the other.

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SIZE OF HOLD: 46 ft. 8 in. (14.23 m.) x 10 ft. (3.05 m.)
FLOOR AREA: 426 sq. ft. (39.6 sq. m.)

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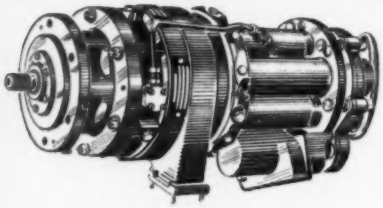

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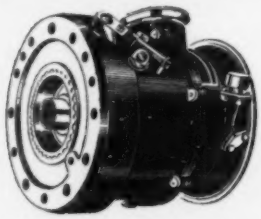

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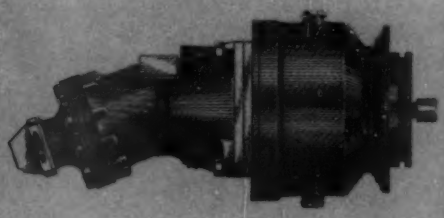

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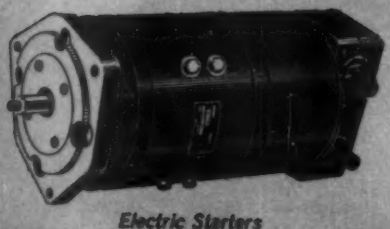


Electric Starters

Starter Generators

Air Transport . . . .

(*Continued from page 568*)

But this citizen will hardly be aware of the less important little difficulties which hamper and cause loss and trouble to the charter operators and which are, in their way, so very symptomatic of the way in which the modern world is being run.

Typical of the more irritating of these difficulties is the way in which certain governments protect their national airlines by withholding permission for the operation of passenger charters —such as those involving the bulk movement of ships' crews— so long as there may be capacity available on the national company's scheduled services. Such protectionist policies are rational and reasonable enough in theory, but can be, and often are, so extremely troublesome and unjust in their practical applications that they can fairly be described only by the term restrictive practices.

The real trouble to both operator and charterer is caused by dilly-dallying over the issue of the "No Objection" certificate which must be obtained before the charter can be executed. The injustices lie in the fact that the business may be lost to the charter company and broker at so late a moment that it is not possible to find other loads, and in the implicit denial to the charterer of his right to choose his own means of transport. If, as sometimes happens, a certificate is not forthcoming and the ship's crew (for instance) is flown by the scheduled airline, the seats have to be paid for at normal passenger rates and the whole operation will cost much more than it would have done if the business had been left to find its own market.

A simple example might involve the long-distance movement of a ship's crew from the East to Europe. This business was, in one particular case, offered to the local national long-haul carrier, which refused it because capacity was not available. The job was then offered to a British charter operator, but a "No Objection" certificate was refused because the national carrier had by then found some capacity. Clearance was granted at a late hour only when the national scheduled carrier had finally filled its seats.

Normally the objections and the planning and re-planning have been very much more complicated than in this case— which is quoted merely as an example of the way in which national restrictions can cause trouble and financial loss to the smaller operators.—H.A.T.

ATC for a Test Team

TWO thoughts, among others, are likely to strike the visitor who is given a demonstration of the new Decca long-range surveillance radar equipment installed by Vickers-Armstrongs at their Wisley test-flying centre. One is that modern 10-cm. S-band equipment can offer the kind of display quality and discrimination which may lead air traffic controllers back to the idea of using radar for direct control as well as for supplementary monitoring information. The other is that the test flying of modern aircraft requires a ground control organization of the highest equipment standards and efficiency.

The position of Wisley—within nine miles of London Airport and hemmed in by other aerodromes and by two principal airways—does demand rather special attention to ATC methods. But similar problems face the controllers at other manufacturers' aerodromes and it is significant that Vickers should have taken so much pains with its control equipment and should have installed this new MR 100 radar in addition to the Decca 424 approach radar which has been in use at Wisley for five years or so.

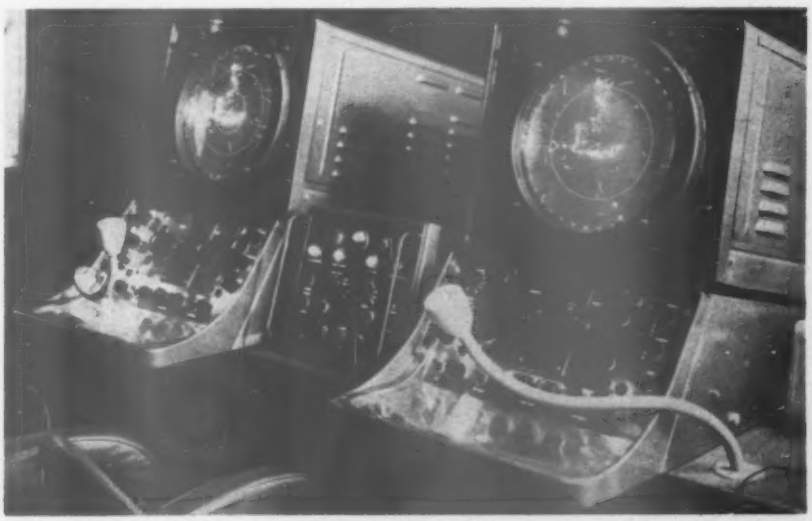
The MR 100 can be considered as a somewhat simplified and modified version of the D.A.S.R. 1 terminal air surveillance radar the features of which were outlined in THE AEROPLANE of June 13, 1958. It gives solid coverage to 100 miles for fighter-size aircraft at 40,000 ft. and, with the relatively small scanner possible when using the 10-cm. band, gives a six-second rate of "picture" renewal. As installed at Wisley there are two displays, one of which is normally set for a range of 80 miles and the other for a range of 30 miles.

Each display has interscan range and bearing strobe facilities and the origin of this strobe can be off-centred to any point of the display. As the line is "laid down" and its length adjusted to connect the aircraft echo with either Wisley or any other selected point within the range of the equipment, course-to-steer and distance-to-go figures appear in windows below the display. This, subject to correct echo identification, provides just about the quickest action-information for a harassed test pilot that it is possible to imagine.

Such information has become fairly vital with the speeds, limited endurances and wide altitude-variations of modern military aircraft. The days have long passed when a test pilot could make a series of climb, level speed and diving tests above or in cloud and complete the whole routine to a pattern which brought him back reliably to some point within a few recognizable miles of his base.

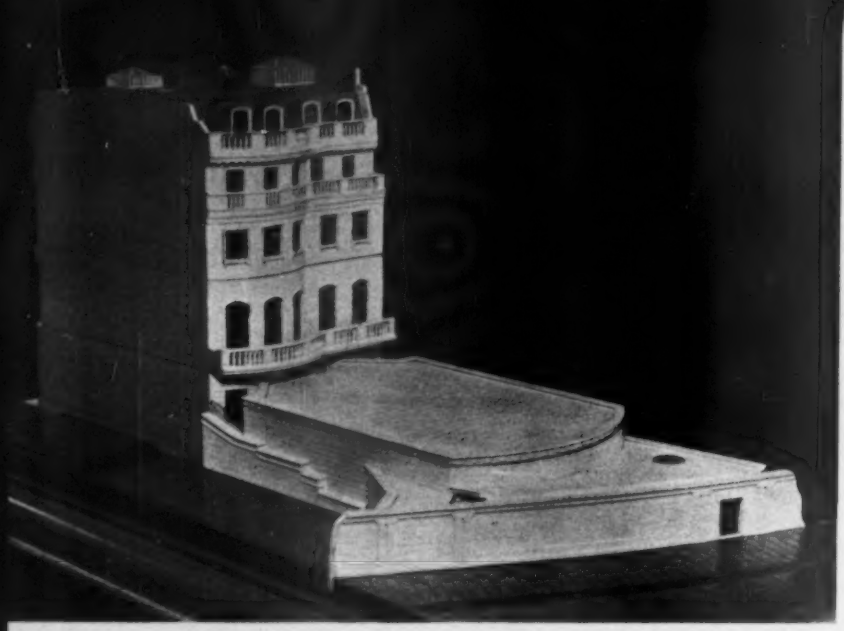
From Wisley the usual routine is to fly out on a westerly heading at 1,500 ft. for about eight miles before starting a climb. The controllers use the radar to maintain a watch on the Vickers aircraft and to ensure that separation is maintained in relation to any other traffic on a plan-position basis and regardless of the altitudes of their own or other traffic.

The MR 100 equipment at Wisley has been very thoroughly evaluated in service before being accepted and the tests were done, for the most part, using Scimitars as "targets." The minimum performance demanded was 40 miles at 40,000 ft.; in fact, these relatively small aircraft have been reliably plotted to 100 miles or more at this altitude. A great advantage of the use of a 10-cm. band radar is that there are few ground siting problems and the scanner can be mounted well above ground level. The Wisley equipment has a beam width of 3° nominal with a high-angle coverage up to 20°. A valuable incidental feature of the display is that aircraft trails remain faintly visible for periods long enough for tracks to be compared—yet the afterglow forming the "tadpole" is never so bright as to distort the pinpoint echo as it is re-formed at each rotation of the scanner.



The display units and control panels of the MR 100 in the operations room at Wisley. That on the right is normally set for 30-mile range coverage. The counters for the automatic bearing and distance figures from the interscan markers are in the windows immediately below the displays.

D



A Lecture Hall for the R.Ae.S.

Photographs copyright "The Aeroplane and Astronautics"

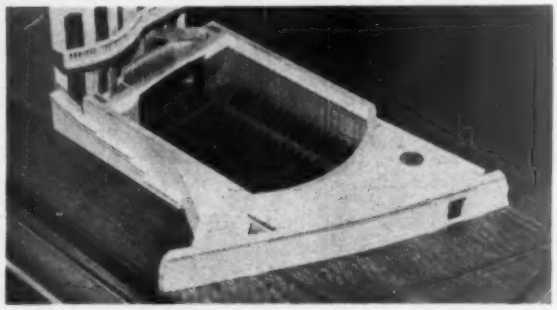
GOOD NEWS for all members of the Royal Aeronautical Society came last week from 4 Hamilton Place with the announcement of a proposal to build a lecture theatre behind the Society's home there. Members of the oldest aeronautical society in the World have always suffered the disadvantage of having to rely on the good offices of other learned Societies and Institutions for lecture-hall accommodation on those occasions when the space and facilities available in their own library have been inadequate. And they have, to say the least, been numerous.

There have, of course, been very good reasons for this shortage of accommodation and for years it has been a major problem to exercise the minds of the Council members. Now, it seems, an opportunity has come about which should—given prompt support by the Society's members—remove the long standing anomaly of a most distinguished technological organization with a palatial home but no real lecture-room facilities.

As the photographs on this page show, the proposal is for a single-storey addition at the back of 4 Hamilton Place. The spacious hall thus provided would seat about 320 people and the entire project, complete with furnishing and equipment, would cost some £150,000. Clearly the Society must look to its members and friends for a major part of this sum. Indeed, they have had a measure of help already part-promised; one large aircraft company has indicated willingness to consider a contribution of £20,000, a smaller company likewise £5,000, and a "medium-sized company concerned with aeronautical equipment" another £5,000. About a third of the required sum, it is hoped, will come from the members themselves and from the R.Ae.S. Endowment Fund. If, for example, every member made a contribution equivalent to his annual subscription, about £40,000 would be forthcoming.

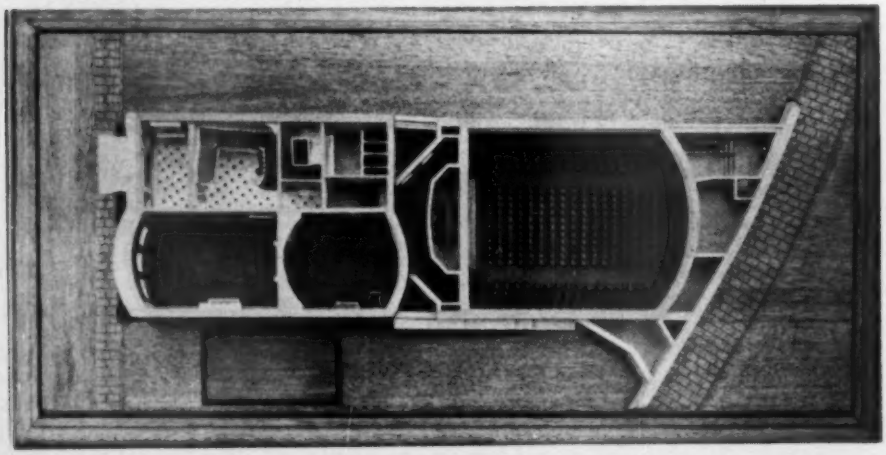
Gifts of furniture and/or equipment would be welcomed by the Society and here, too, there have already been indications that this sort of help will be forthcoming. One of the R.Ae.S. overseas Divisions favours a contribution in this form so as to emphasize the Society's links with the Commonwealth.

Speed of decision is, however, the essence of this proposal because the whole project depends very largely on the timetable laid down for the Hyde Park Corner Reconstruction Scheme. Under this plan for road improvement it will become possible to gain access to the ground at the back of the Society's house, for building purposes. This access will be permitted only while the new road is actually being made. Thus unless this opportunity is taken the only means of getting materials to the site is through the building—and this would prove prohibitively costly.



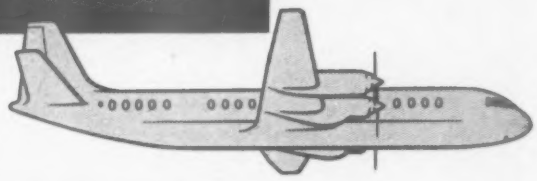
According to the Society's brochure appealing for funds, the extra land needed for the new lecture theatre will be leased from the Crown—as is that on which 4 Hamilton Place itself stands. The present lease expires in 1966 but the Council have been assured by the Commissioners for the Crown Lands that they are prepared to grant a new lease for the whole site until 2004.

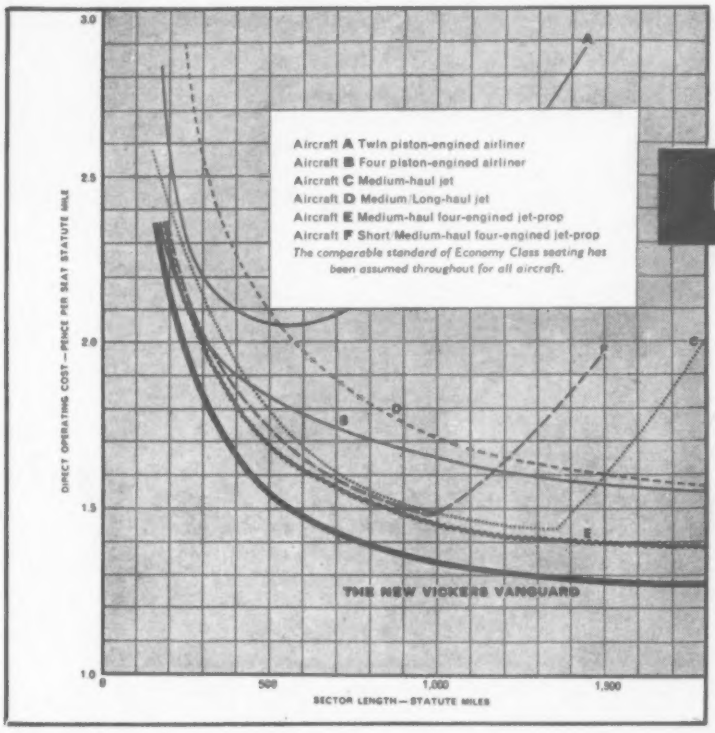
This most worthwhile project is a refreshing sign of courage to expand at a time when words such as recession and economy are so widely heard. It is to be hoped that the Royal Aeronautical Society will obtain all the financial help it needs—and get it quickly.



The plan-view photograph (left) of the model shows how the present building at 4 Hamilton Place and the proposed lecture theatre are related. The rear door into the new Apsley Carriageway is to be an emergency exit only; entrance to the hall will be through the main building.

LOWER FARES





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The attraction of cheap rate tickets has already been proved on long distance routes. On North Atlantic flights 60% of all passengers now travel at economy fares.

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At 65% passenger load factor the new Vanguard, in its 139-seater economy layout, can operate at 10% clear net profit with fares ranging from 29-50% below current tourist rates. In calculating these figures actual routes, current fares and current costs have been used.

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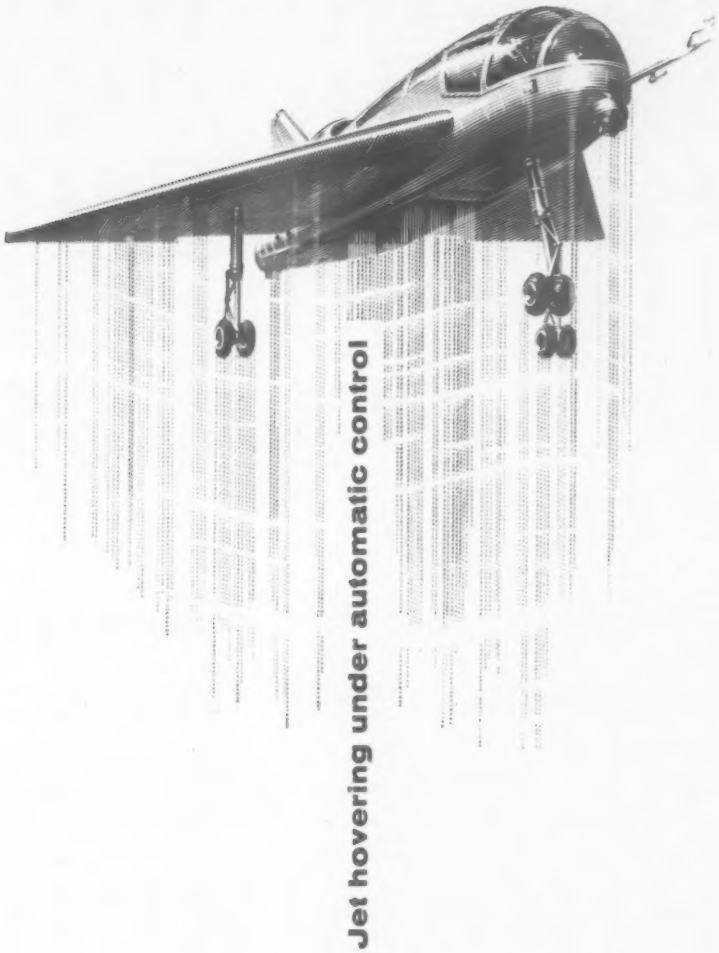

Jet hovering under automatic control

The successful completion of the first series of free flight trials by the Short SC.1 **VTOL*** jet research aircraft has made a significant advance towards the time when runways will be obsolescent.

Shorts are now approaching the final phase of the SC.1 development programme – transition from hovering to forward flight and the reverse. A particular cause for satisfaction during the free flight trials was the precise control of height. This was made possible by the excellent handling characteristics of the Rolls-Royce RB.108 engines and the faultless performance of the autostabiliser, which gives automatically controlled stability during hovering before the wing-borne stage is reached. The autostabiliser embodies an automatic system of 3-axis gyro controls (triplicated for safety) using some of the air from the main supporting jet engines fed to control nozzles in wing tips, tail and nose. This unique autostabiliser control system has been developed in the experimental shops and laboratories at Shorts in Belfast – as indeed was the aircraft itself and the special gantry used for preliminary hovering. The development continues . . .

VTOL* = VERTICAL TAKE-OFF AND LANDING

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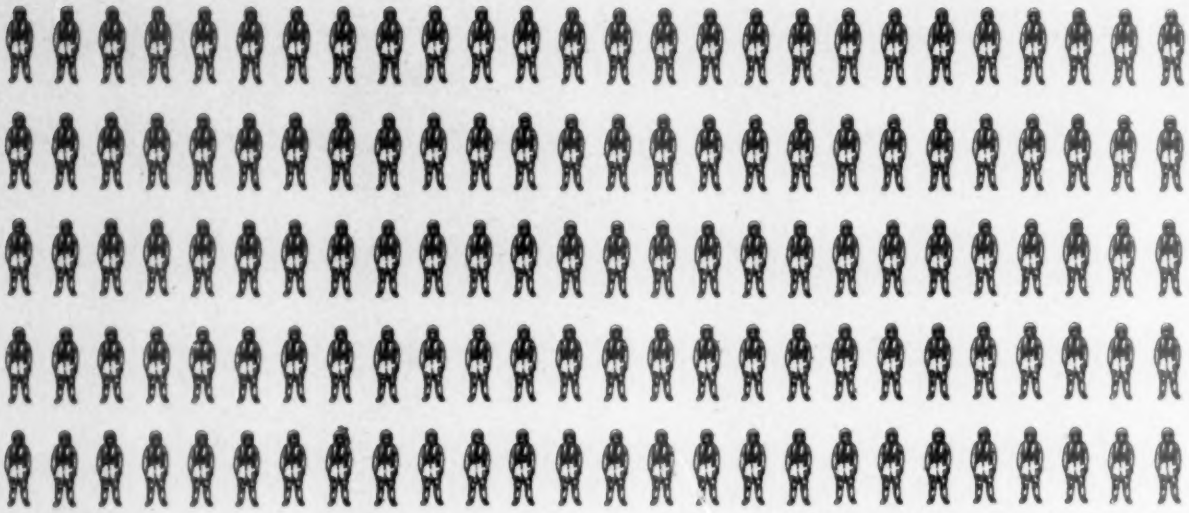
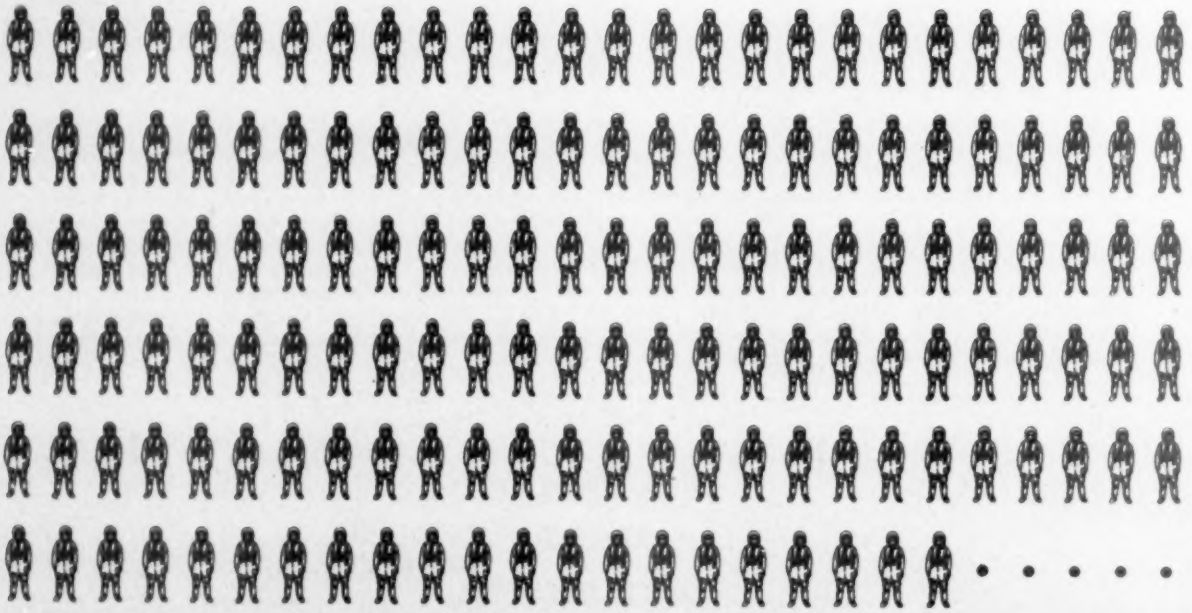


To date 281 lives have been saved by Martin-Baker Ejection Seats.



MARTIN-BAKER AIRCRAFT COMPANY LIMITED

The Fighting Services

F.A.A. Helicopter Pilots

AS was announced in the House of Commons on March 9 during the Navy Estimates debate, a special five-year commission on the Supplementary List of the Royal Navy is to be introduced to recruit helicopter pilots. This scheme is designed to help meet the Service's need for helicopter pilots for anti-submarine search and rescue, and commando duties.

Training under the new scheme will start with preliminary general naval training at H.M.S. "Thunderer," Plymouth, after which *ab initio*, pilots will receive basic flying instruction on Provosts at No. 1 F.T.S., R.A.F. Linton-on-Ouse, followed by a 14-week helicopter conversion course and a three-week anti-submarine course at naval establishments. On completion of this there will be a further 14 weeks' operational flying training at the recently opened naval helicopter station at Portland (see THE AEROPLANE AND ASTRONAUTICS for May 1, p. 532).

Although complete details are not yet finalized it is understood that students will be awarded provisional "wings" at the end of the helicopter conversion stage which will be confirmed on the successful completion of operation flying training. The complete dual and solo flying training programme is to include 110 hr. on Provosts at No. 1 F.T.S., 70 hr. helicopter conversion flying and 70 hr. operational training at Portland. The first course is expected to start in June next.

New Pathfinders

STARTLING figures for the R.A.F.'s new striking power were put out by AIR CHIEF MARSHAL SIR GEOFFREY TUTTLE, D.C.A.S., at the Pathfinders' Dinner at the Dorchester, London, on May 7. Compared with the wartime bomber, he said, today's missile had something like two hundred times the height, a hundred times the speed, and twice the range. The R.A.F. has a ballistic missile which works, another which was going to work, and three new aircraft on order.

Sir Geoffrey took Mr. R. E. Hardingham, chief executive, A.R.B., to task for implying in his earlier speech that the R.A.F. should become just a large Transport Command. The object of the R.A.F. was, he said, to fight as well as to take people around to fight.

On recruiting, the R.A.F. was not getting enough general duties and technical officers. The effects of the White Paper were still being felt and the young who were influenced by their space-age comics were growing up with the idea that flying was old-fashioned. The balance must be restored.

MR. HARDINGHAM, in his toast to the R.A.F., had acknowledged the debt that civil aviation in this country owed to "Service." The outstanding achievement of the R.A.F. was, he said, the production of great men. The future looked less rosy, with its soulless misguided weapon, though he looked forward to an up-to-date Transport Command equipped with really modern jets, including a supersonic transport.

PETER SWAN, urged by his fellow Pathfinders to speak in English instead of his native Australian, welcomed the guests, among whom were the Argentinian Air Attaché, Air Cdre. Sola Claret, and G. I. "Mac" Pearson and G. L. Chambers, respectively the master and clerk of GATCO.

Then AIR CHIEF MARSHAL SIR JOHN BAKER spoke of "this happy gathering," and asserted his belief in the air business. The Pathfinder Force, like the R.A.F., was a Commonwealth body and we must encourage youngsters to believe in what we believed in before.—WREN.

Photograph copyright "The Aeroplane and Astronautics"

WRIGHT JUBILEE TROPHY.—The annual aerobatic contest between instructors from each of the jet flying training schools in Flying Training Command took place at R.A.F. Little Rissington on May 7. Air Marshal Sir Hugh Constantine, the A.O.C.-in-C. (centre), is seen with the winner, Flt. Lt. D. F. Moffat (left), R.A.F. College, Cranwell, and the other competitors.

Birmingham Air Squadron Dinner

AMONG the guests attending the University of Birmingham Air Squadron's annual dinner on April 21 were the Vice-Principal of the University, the Rev. Professor G. W. H. Lampe; Professor G. F. Mucklow, head of the Mechanical Engineering Department; Air Vice-Marshal J. F. Hobler, A.O.C. No. 25 Group, and Air Vice-Marshal H. A. V. Hogan, S.A.S.O., Flying Training Command.

In his reply to the toast "The Squadron," SQN. LDR. J. D. COTTER, the C.O., paid tribute to Professor Mucklow's work and fine support. He mentioned that the rules for the Hack Trophy had changed and, before entering for this trophy, University air squadrons had to win one of the four regional trophies for which all squadrons have to compete. He felt that this might not be advantageous, as Birmingham's record in the Hack competition had been achieved by a high standard spread throughout all members, whereas the regional trophies depended more on the successes of individuals.

Replying to the toast to the guests, AIR VICE-MARSHAL HOGAN stated that it was rather disappointing that the strength of the Airfield Construction Flight was at present only at 50%, and he made mention of the good work done by Airfield Construction Units overseas. He felt certain that, with the interesting future programme now in hand, by the next annual dinner the Flight would find itself at full strength.

After the dinner the Priestley Trophy for the best all-round cadet and the Deakin Trophy for aerobatics were presented by Air Vice-Marshal Hogan. The Priestley Trophy was awarded to Cdt. Plt. J. A. Morton, and the Deakin Trophy to Plt. Off. I. G. Conardi.

Royal Tournament

PARACHUTING will be the main theme of the R.A.F.'s principal display at this year's Royal Tournament at Earls Court, London, between June 3 and 20.

Transport Command, who are responsible for training all Army and R.A.F. parachutists, will show what happens from the time a man volunteers to join the Parachute Brigade until he makes his first descent. The second part of the display will illustrate how a R.A.F. Parachute Medical Team goes into action to bring aid to an injured man in otherwise inaccessible territory.

Other R.A.F. items in the Royal Tournament will demonstrate the lighter side of Service activities. These are to include a gymnastic display by 40 P.T.I.s and a number of bands from various Service establishments.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Bomber Command: Gp. Capt. J. R. Morgan, O.B.E., to Headquarters as Command Education Officer.

Fighter Command: Wg. Cdr. A. W. Oldroyd, D.F.C., A.F.C., to R.A.F. Wattisham, to command the Administrative Wing.

Flying Training Command: Wg. Cdr. E. James, D.F.C., A.F.C., to the Central Flying School as Chief Instructor, with acting rank of Gp. Capt.; Wg. Cdr. D. M. Finn, D.F.C., to Glasgow U.A.S. to command; Wg. Cdr. A. W. Eyre to No. 2 F.T.S., R.A.F. Syerston, as Senior Technical Officer.

Signals Command: Wg. Cdr. H. B. Martin, D.S.O., D.F.C., A.F.C., to Headquarters as Gp. Capt. in charge of Operations, with acting rank of Gp. Capt.

R.A.F. Germany (2nd T.A.F.): Wg. Cdr. P. J. Dunlop to No. 646 Signals Unit to command.

Far East Air Force: Wg. Cdr. S. Findlay, M.B.E., to Headquarters for administrative staff duties.

Other Appointments: Wg. Cdr. W. A. M. Oram to Headquarters, British Forces Arabian Peninsula, for legal duties; Sqn. Ldr. R. O. Bater to R.A.F. Khormaksar, Aden, for technical duties, with acting rank of Wg. Cdr.

ASTRONAUTICS and MISSILES

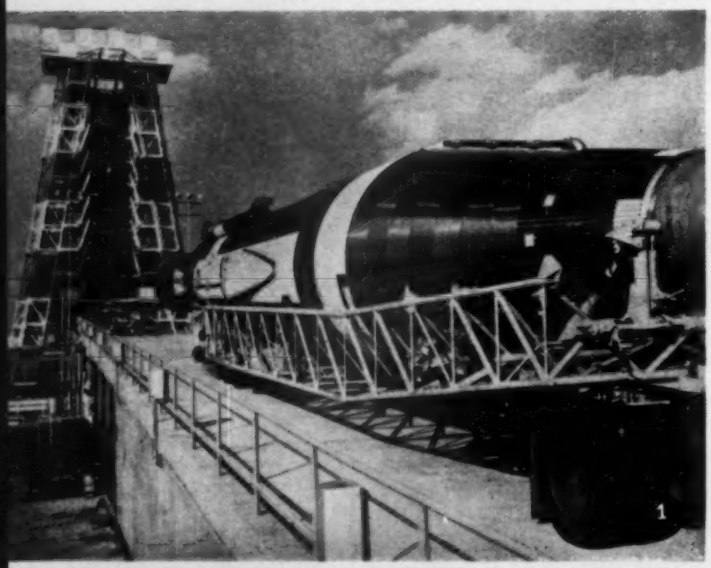
J. R. Cownie reports on the

Premier Western Missile Range

CAPE CANAVERAL, on Florida's east coast, has achieved World-wide fame as the launching point for U.S. long-range missiles, satellites and space probes. But the Cape itself, although it hogs the headlines, is only one part of the vast missile-proving range operated by the U.S. Air Force Missile Test Center—itself but one of 10 U.S.A.F. research establishments.

The Missile Test Center is responsible for the Atlantic Missile Range, which extends more than 5,000 miles south-east from Cape Canaveral into the South Atlantic. It is also responsible for the flight testing of missiles and space projects for NASA, the U.S. Army, the U.S. Navy, the U.S.A.F. Ballistic Missile Division and Wright Air Development Center, and for the analysis and recording of test-flight data. The headquarters of the Center are at Patrick A.F.B., 13 miles south of Cape Canaveral, which provides logistic and administrative support for the Atlantic Missile Range.

Cape Canaveral's history as a missile-test base goes back to 1946 when it was chosen for the launching of long-range missiles because of its isolation, which meant that safety and security costs would be low, and because it offered a long-distance range over sea relatively free from major shipping lanes and land masses. At the same time islands in the West Indies and South Atlantic were ideal locations for missile-tracking stations needed to record missile performance data.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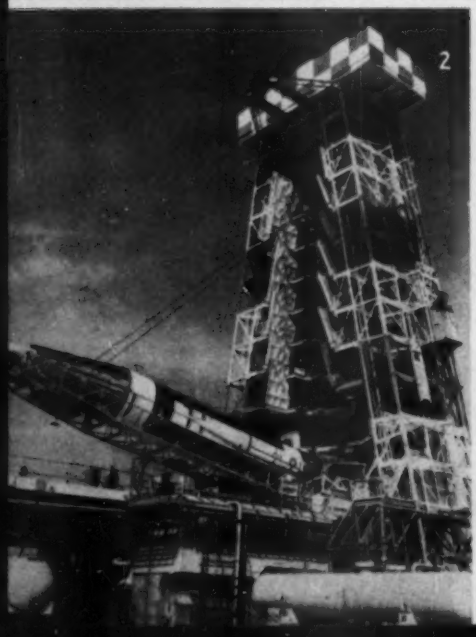
The first missile launching at Cape Canaveral was in July, 1950. Since then launchings have become increasingly frequent, and the facilities of the range have been regularly expanded as more and more down-range tracking stations have come into action. As the map of the range shows, there are five tracking stations in the Bahamas, one in the Dominican Republic, and others on the islands of Puerto Rico, Antigua, St. Lucia, Fernando de Noronha and Ascension. Five range ships are sited between St. Lucia and Ascension, because the only tracking station over this long stretch of ocean is at Fernando de Noronha; a sixth ship covers the 1,100 n.m. extension of the range beyond Ascension.

Thus from Patrick A.F.B. the Missile Test Center controls "an extremely complex operation," to quote the words of an official hand-out; it includes Cape Canaveral, with its launch, tracking and support facilities, 12 subsidiary telemetry and camera sites in Florida and the 11 down-range island stations. It employs more than 19,000 military and civilian personnel, of whom more than 1,000 are on down-range stations. It operates 11 airfields and a fleet of range vessels varying in displacement between 935 and 7,400 tons. The range represents an investment of $500 million; its monthly wage bill alone is $14 million.

The Missile Test Center is commanded by Maj.-Gen. Donald N. Yates, who is responsible for the range and its base at Patrick, as well as for the supervision and co-ordination of test programmes. The actual operation of the range is sub-contracted to Pan American World Airways, which took on this task in 1954. The company was selected for this rôle because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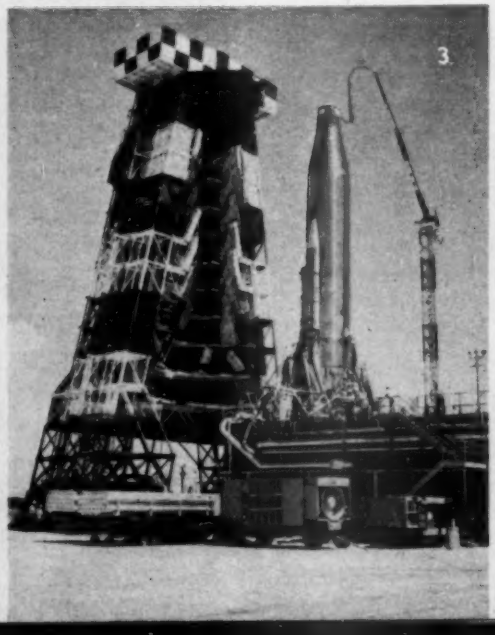
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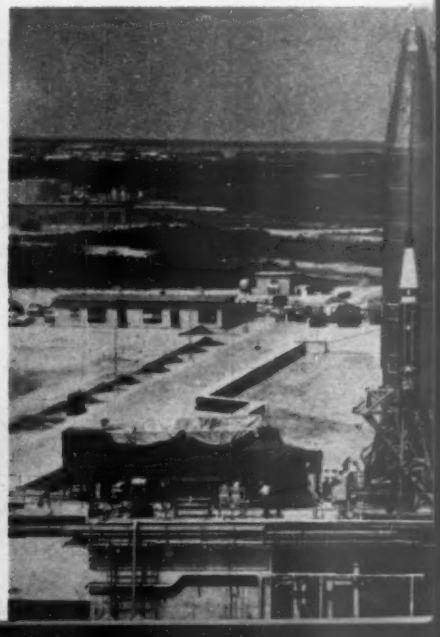
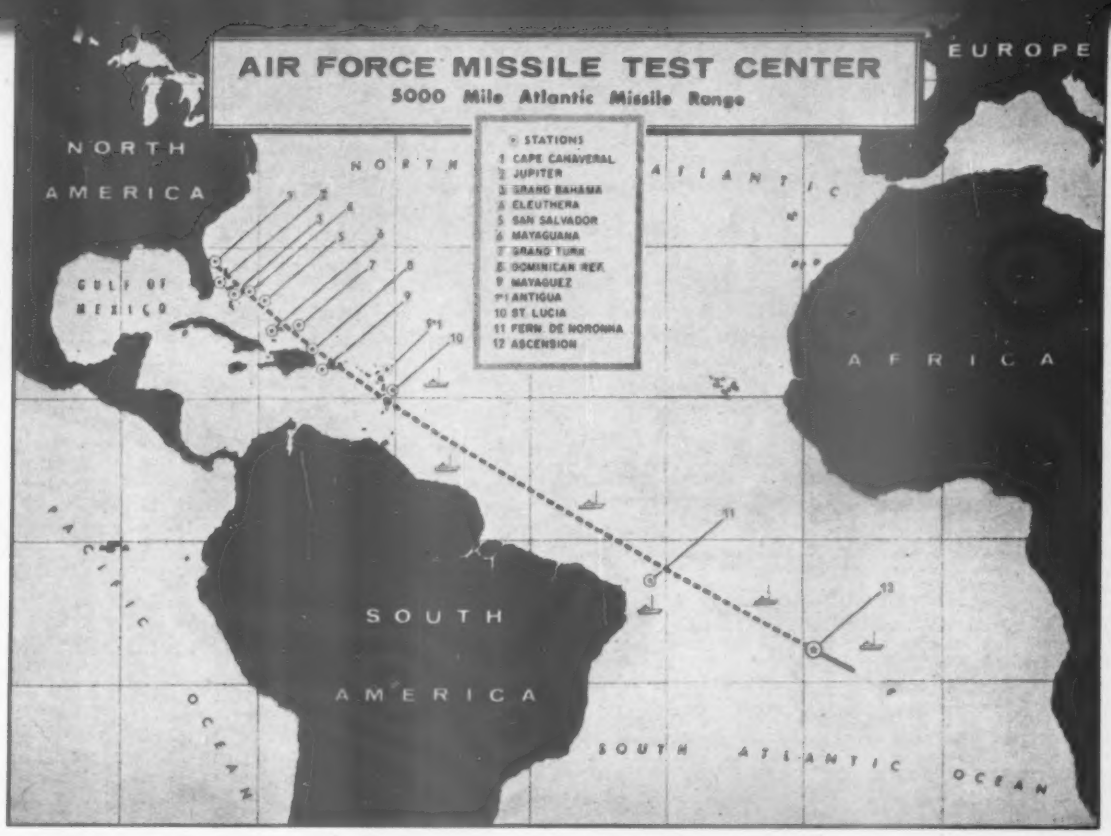




of its extensive experience in operating remote island bases.

Pan American in turn sub-contracts certain functions to specialist companies; chief of these is the Radio Corporation of America, which is responsible for range instrumentation and data reduction.

Cape Canaveral has paid the price in adverse publicity for being the best-known missile launching site in the World. This is obviously to some extent a sore point with those who operate the range, and it was impressed on us during briefings that in many cases tests which had apparently failed because missiles disintegrated had in fact provided the required information. On the first Atlas shot, for example, 95% of the test objectives were achieved although the missile flew for less than a minute.

In an interview Gen. Yates stressed that the range was devoted mainly to research and development work and that its end product was test reports, which might be up to 150 pages long for each missile launched. Although operational training launches were made with some missiles, this was subsidiary to the main purpose of Cape Canaveral.

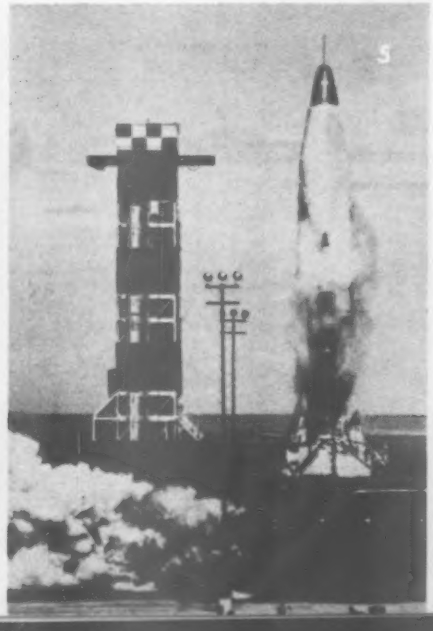
To achieve its primary rôle the range relies on extensive and highly accurate instrumentation. For the first mile or so after launching, missiles are tracked to within a few inches by high-speed cameras. For ranges up to 15 miles, ciné-theodolites are used which give a position accuracy of about 30 ft.—beyond this range accurate tracking radar takes over. With the TLM 18 radar used, three installations—at Cape Canaveral, Antigua and Ascension—allow a missile to be tracked over the entire length of the range.

The Azusa tracking system is used to measure the exact position of ballistic missiles travelling at up to 15,000 m.p.h. and altitudes of several hundred miles. It relies on electronic phase-comparison techniques to detect positional changes of 15 to 30 ft. at ranges up to 500 miles. In ICBM tests the position of a missile must be measured twice every second to an accuracy of less than one missile length; this must be done as far as the burn-out point, which is a slant distance of about 200 miles from the launching point.

The output from the Azusa system is fed directly into an electronic computer which acts as an impact predictor; as soon as missile thrust is cut off this gives the position at which the nose-cone will land to within a mile.

Very accurate photography over long ranges is necessary to study missile flame patterns, autopilot responses, booster ejection and stage separation. These photographs are taken at ranges up to 200 miles with a ROTI camera, which has a 500-in. focal length and a 24-in. aperture.

The main source of information on missile behaviour is provided by telemetry—which can give information on up to 185 aspects of missile performance in a single flight, during



ATLAS LAUNCH FACILITIES.—These views, of different versions of Atlas, show features of a typical ICBM launch-pad complex at Cape Canaveral: 1 An Atlas on its transporter is hauled up the concrete ramp leading to the launch pad. 2 Transporter and missile are winched upright in the maintenance tower, and hinged work platforms on the tower are lowered. 3 When ready for a launching the platforms are raised, and the maintenance tower is moved backwards and onto transverse rails to 500 ft. from the launch pad. 4 The tower-transfer rails are in the right foreground; in the background is the blockhouse, 750 ft. from the missile, from which the launch is controlled. 5 A launch as seen from the direction of the blockhouse.

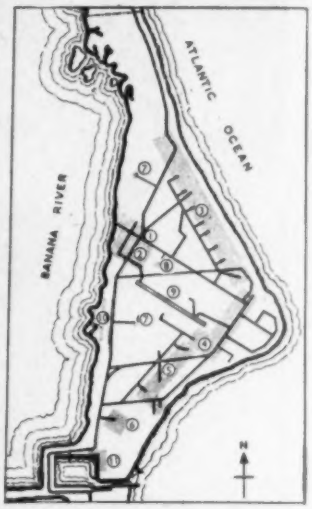
which as many as 250,000 individual readings will be recorded. This information goes through automatic data-reduction computers and is incorporated in the flight-test report.

A logical progression is followed in missile testing at Cape Canaveral. The first tests are made with only the basic elements of a missile system, usually the airframe, part of the propulsion system, and an autopilot. In these early tests the structural integrity, control response, flame patterns and effect of vibrations are studied.

After the basic elements of the system have been successfully tested the guidance, re-entry bodies, simulated warheads and fusing are progressively added until the complete weapon system has been flight-tested. As the airframe and propulsion systems are proved, the emphasis shifts to re-entry and guidance accuracy. The Atlas, for example, is now in this stage of its development; about 50% of the telemetry equipment on current Atlases is carried in the nose-cone to give information on re-entry.

The Atlas Ds now being test-launched represent the "interim operational missile"; all are test-fired to their maximum range, which is often less than the full range of the operational Atlas, because test missiles carry a considerable load of telemetry equipment and are fired over both high and low trajectories.

According to Gen. Yates sufficient experience has now been gained for the total number of launchings in a missile programme to be estimated in advance. In practice more launchings may be required for some phases of the programme than originally estimated, but this is usually counterbalanced by other phases which need fewer launchings than scheduled. The Titan, which benefits from experience with the Atlas, is coming ahead faster than expected because all four launches so far have been very successful. It is, in fact, catching up with the Polaris, whose development to date has been slower than planned.



CAPE CANAVERAL.—1. Central control. 2. Industrial area. 3. ICBM launch area. 4. Launch area for smaller missiles. 5. IRBM launch area. 6. Transmitter area. 7. Receiver area. 8. Guidance area. 9. Skid strip. 10. Fuel storage. 11. Harbour facilities.

No launchings are made from Patrick A.F.B.; all are from Cape Canaveral itself, which is a 15,000-acre strip of scrubland between the Atlantic and the Banana River. On this are the launching areas for the IRBMs, ICBMs, aerodynamic-cruise missiles and space vehicles, as well as the industrial area in which the missiles are thoroughly checked on arrival at the base. Immediately to the south of the Cape is Port Canaveral, which will take deep-sea ships; some of these will be used by the U.S. Navy for the Polaris programme.

To the north is the launching area for intercontinental missiles. At the tip of the Cape is the launching area for the smaller missiles and the aerodynamic-cruise missiles, while to the south is the IRBM area, which has launching pads for Thor, Jupiter and Polaris. In the centre of the Cape is a skid strip on which Snarks are landed after they have flown their test missions.

Each launch-pad complex is a self-contained unit—there are four each of these for Atlas and Titan launches, and three for launching Thors and Thor-based test and space vehicles. Each of these complexes includes the missile-servicing gantry, the launch blockhouse and facilities for fuel storage, electrical power and compressed-gas supplies. Coolant water is also laid on; it can be supplied at the rate of 30,000 gal./min. for captive firings of the Atlas.

The blockhouses are very heavily built; at Atlas sites they have been designed to withstand an explosion equivalent to 50,000 lb. of TNT at a distance of 50 ft. The explosive potential of a missile decides the structural design and position of its blockhouse; in the case of Atlas the blockhouse is 750 ft. from the launch pad, while the distance for IRBMs is 175 ft.

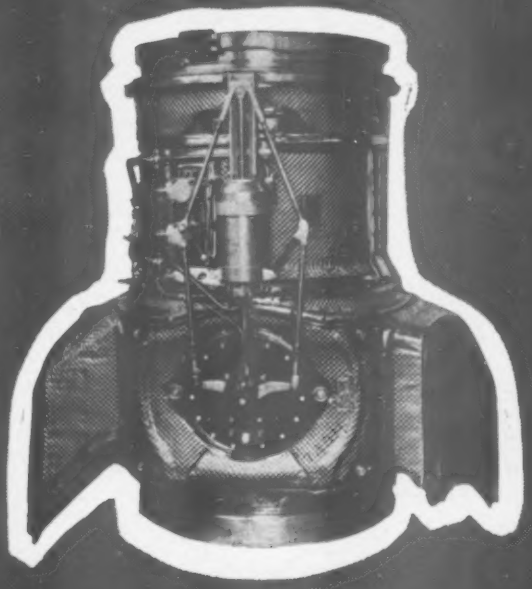
One Atlas site visited was that from which Project Score, the satellite Atlas 10B, was launched. Launch personnel said they were not so elated about this launch as one might expect; space launches of this type interrupted their weapon-development programme, they said, and diverted missiles originally planned for ICBM test launchings. We were told that the time taken between the arrival of an Atlas at the launch site and its firing averaged about a month, most of which time was devoted to checks of its systems and particularly of its instrumentation. Captive engine-running tests were normally only made with the first missile of a new series.

Future Plans

According to Gen. Yates the range could cope with five times as many launchings as at present. Considerable expansion of both the launching sites and the range itself is planned. Launch pads are being constructed for Pershing, Minuteman and the Centaur space vehicle.

Extension of the range will be necessary for the Project Mercury man-in-space launchings, which will be made from Cape Canaveral at an inclination of approximately 37° to the Equator. Tracking and communication facilities around the World will be set up for this purpose, including possibly some in Australia, and the Pacific Missile Range will link up with the Atlantic one for this project.

SPACE LAUNCHINGS.—All U.S. satellites and Moon probes except the Discoverer series have been launched from Cape Canaveral. Here the second Thor-based Moon probe is prepared for launching.



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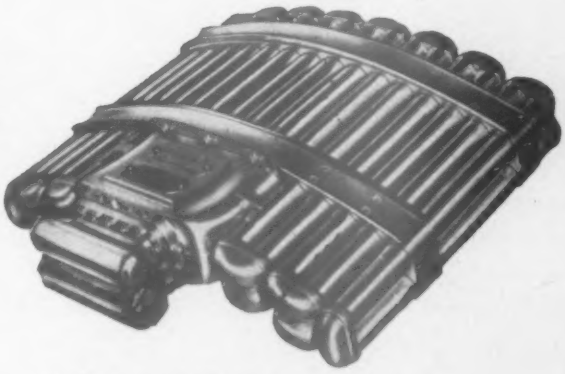

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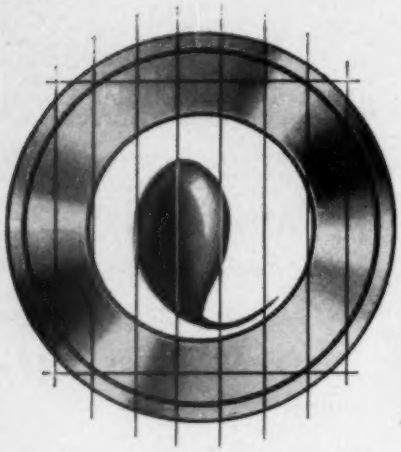

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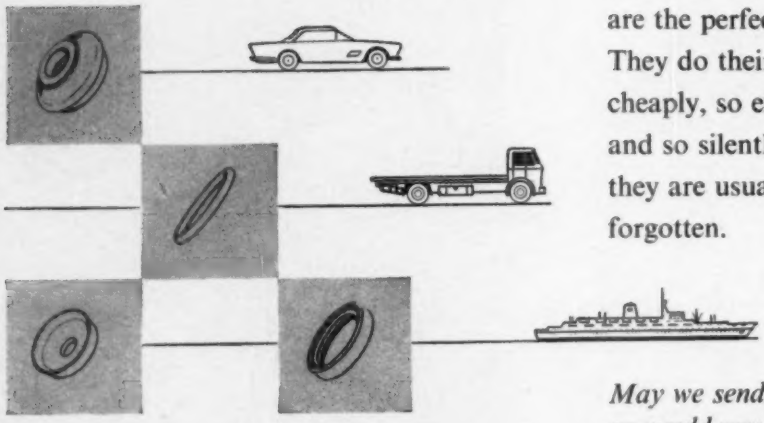

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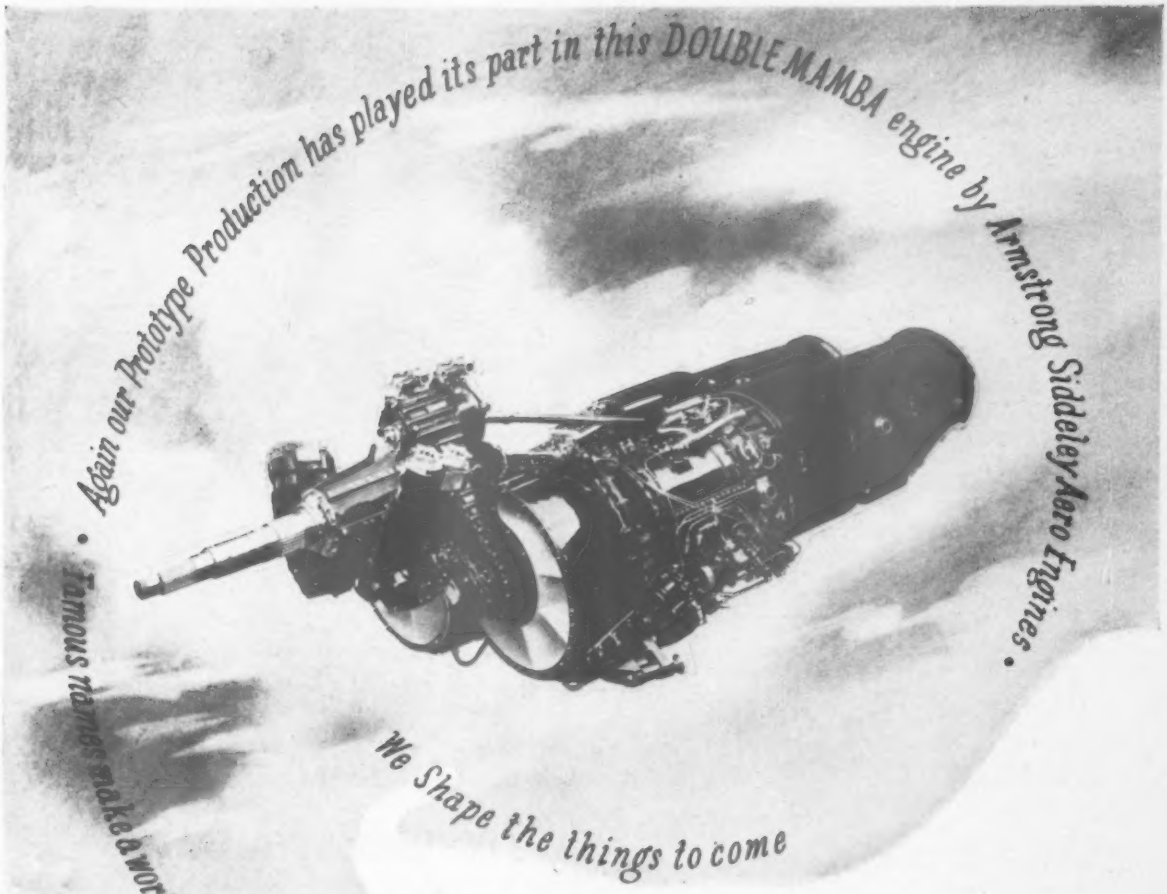
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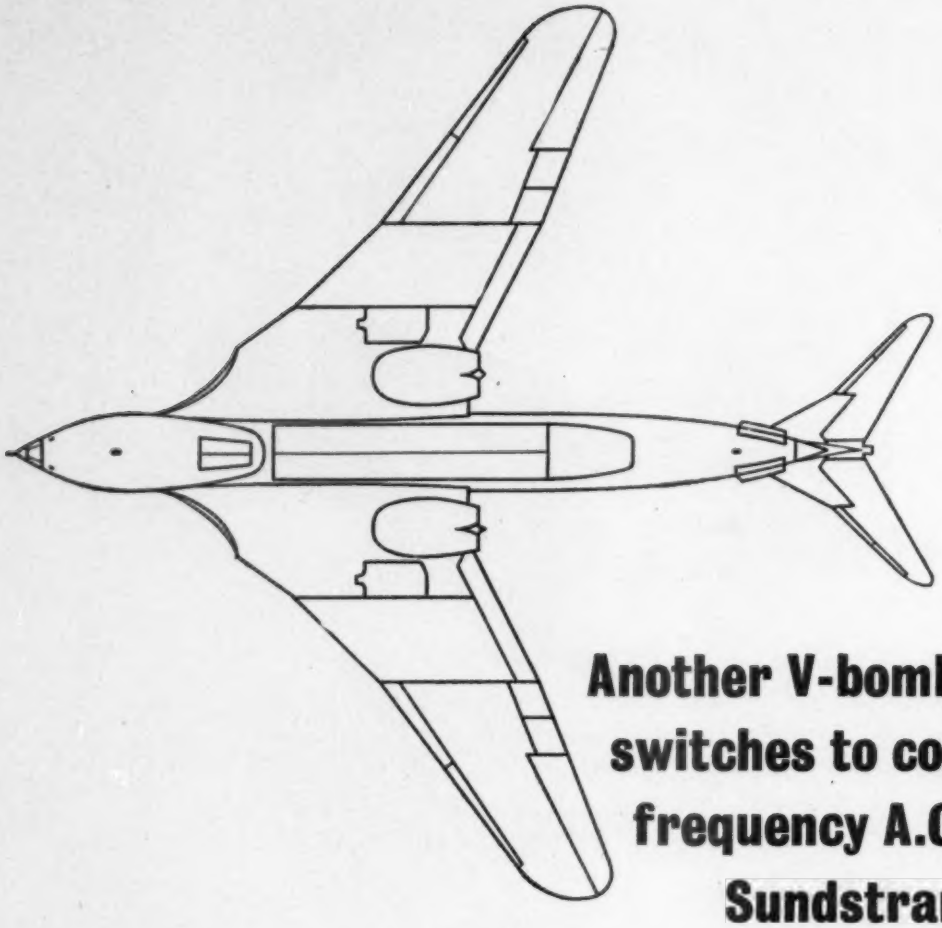

Another V-bomber switches to constant-frequency A.C. by Sundstrand

THE HANDLEY-PAGE VICTOR MARK II is the second of Britain's V-bombers to be fitted with the constant-frequency A.C. electrical generating system designed, developed and produced by the English Electric Aircraft Equipment Division.

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Planning for Moon Exploration

A WORKING group has been appointed to conduct long-term scientific explorations of the Moon's surface and environment, the National Aeronautics and Space Administration has announced.

Headed by Dr. Robert Jastrow of the NASA headquarters, the group is one of a number recently set up to plan experiments and correlate forthcoming satellite and space-probe projects. The Moon-programme is:—

(1) Probes and orbiters. Payload packages designed to obtain information on the lunar environment (i.e., extent of the lunar atmosphere, magnetic fields, interplanetary plasma, fluxes of energetic particles and beta and gamma rays emanating from the Moon's surface).

(2) Advanced orbiters. Satellites circling the Moon and instrumented to give data on the shape and mass of the Moon and the structure of its surface.

(3) Hard landings. Instrumented packages containing devices such as seismographs and magnetometers to measure properties of the lunar surface. The payload will be packaged to survive impact.

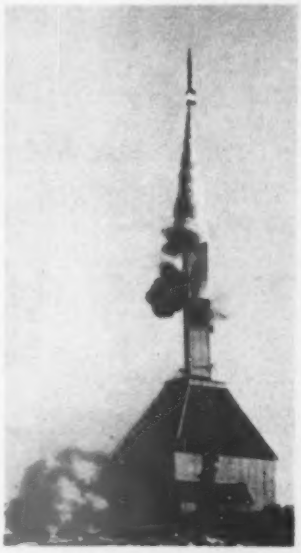
(4) Soft landings. Payload packages containing more delicate instruments such as television cameras. Retrograde, or reverse-thrust, rockets will be used as "brakes" in the soft landing case.

Firing schedules and payload details are still under review, but a number of agencies have already proposed experiments.

Canada and U.S. Plan Joint Space Activities

PROPOSALS by the Canadian Defence Research Telecommunications Establishment for the continuation of joint U.S.-Canadian ionospheric experiments have been accepted by the National Aeronautics and Space Administration.

For many years the Americans have been exploring the ionosphere over the Arctic with Aerobee, Aerobee-Hi and Nike-Cajun rockets using a base at Fort Churchill, in the south-west corner of Hudson Bay in the Province of Manitoba. The Canadians have been actively assisting this work, which is now being extended to include the design and construction of instrumentation for an artificial satellite to be orbited by an American launching vehicle. Canadian-built instruments will also be fired in American high-altitude rockets. The Canadian research group has also undertaken to design equipment for use at Fort Churchill and other existing ionospheric observation stations in Canada to which rocket and satellite data will be relayed and recorded.



An Aerobee-Hi research rocket being fired at Fort Churchill, Canada.

The research programme, which is strictly non-military, is expected to lead to improvements in contemporary knowledge of the Arctic upper atmosphere by launching rockets in the auroral belt and satellites in polar orbits which penetrate this belt.

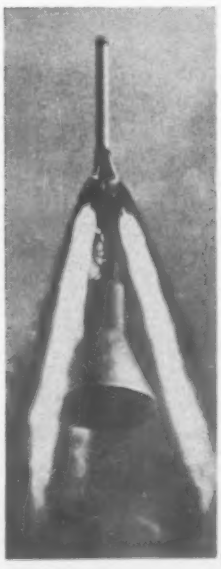
One project the Canadians have in mind is the so-called "top side sounder experiment" whereby a satellite moving above the ionosphere transmits radio signals towards the ground, while ground stations radiate signals into the ionosphere from below. By comparing the amount the signals are absorbed and deflected, much should be learned about the ionosphere's structure.

Early reports suggest that the radio-satellite will be a 3-ft.-diameter aluminium sphere containing about 50 lb. of equipment, with four 70-ft. antennae. Chemical storage batteries will be recharged by solar cells giving a useful life of at least a year. Launching is not expected before 1961.

Space Capsule: Initial Tests

FOUR vital test-phases in the development of the Mercury space-capsule scheduled to put a man into orbit in 1961 are now in progress, namely air drops, escape, scale-model studies and impact tests.

What may prove to be the most critical part of the whole venture—safe recovery after the capsule re-enters the atmosphere—has received first attention. Essentially the air-drop programme is designed to discover the optimum altitude at which to deploy the recovery parachute, the reliability of the parachute system, motions which can be expected during descent, impact forces in both water and ground landings, and reliable methods of recovery after landing.



Initial tests of the parachute recovery system have already been made with a two-stage rocket which launched a recovery package complete with deceleration parachute. The package is believed to have reached a height of about 70,000 ft. before the drag parachute deployed and lowered the research equipment into the sea off the coast of Florida. The package was equipped with flotation gear and a radio beacon to assist recovery.

Escape tests are also going well. When the Mercury capsule is aboard the launching rocket it will be fitted with a pylon-like structure tipped with escape rockets. If the launching vehicle should fail during the initial stages of launching, the escape rockets will fire and separate the capsule cleanly from the booster. Normal recovery by parachute will then take place.

Tests of the escape system, and aerodynamic studies of the capsule-escape combination, are being conducted from the Wallops Island test facility. In a recent experiment a full-scale 1-ton test model was fired to a height of 2,250 ft., whereupon the pylon structure was jettisoned; a parachute lowered the capsule into the water and it was then recovered by helicopter.

Behaviour of the capsule during flight is being studied in the Langley and Ames wind-tunnels, and shortly this work will be extended to the Arnold Engineering Development Center, Tallahoma, Tenn. Free-flying models are also being launched for the same purpose. At Wallops Island small models are subjected to the full velocity range to investigate tumbling characteristics, re-entry dynamics and afterbody heating. For these studies, capsule models are fitted to the nose-tips of research rockets.

In its extensive wind-tunnel programme the NASA uses a complete range of scaled-down capsule-booster combinations planned for various stages of the development programme. For example, research flights will be made with the capsule mounted on top of a Jupiter rocket; wind-tunnel experiments are providing answers to control inputs and trajectories by investigating the lift, drag and static stability of the Jupiter-Mercury arrangement in scale models.

At Langley scientists are using tunnels to determine heat transfer and pressure on the heat shield, dynamic stability, afterbody pressures, pressure distribution, and lift and drag. The Langley tunnels cover the velocity spectrum from just a few miles per hour to Mach 18.

At the Ames Research Center, wind-tunnels are used to study panel flutter, pressures and heat transfer, static and dynamic stability; also lift and drag in the Mach 0.6 to 15.3 velocity régime. Lift, drag, stability and pressure distribution studies in the speed range of Mach 0.5 to Mach 20 are scheduled at the Arnold Center.

When the Mercury capsule descends after its orbital flight it will fall with a velocity of about 30 ft./sec. Drop tests at this velocity in the water-tank facilities at Langley have shown that a safe descent into water can be made with the convex-shaped leading face of the present capsule configuration. In the event of a ground landing, scientists are conducting studies into a crushable material which can absorb the landing shock. Materials now under study include honeycombed arrangements of corrugated plastic and aluminium.

Talon's Talents Tested

A brief commentary on the Northrop T-38 Talon Supersonic Trainer by our U.S.A. Correspondent

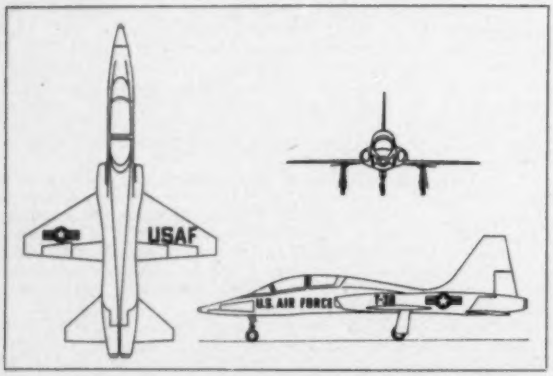
STANLEY H. EVANS, F.R.Ae.S., A.F.I.A.S.

AFTER waiting some four months or so for its pair of General Electric J85 turbojets to mate up with the airframe, the Northrop T-38 Talon supersonic trainer made its maiden flight on April 10 at Edwards A.F.B., California. During the first flight of 42 minutes it reached a height of 35,000 ft. and a Mach speed of about 0.9. Five days later, as we write, it had notched up a total of just two hours of test flying and had performed the sonic initiation rite aided with a pinch of dive-derived gravity. The dive technique was necessary at this time because although the T-38 is designed as a M=1.3 (860 m.p.h.) performer with J85-GE-5 high boost afterburning engines, these are not yet available for installation and so the initial flight testing is being done with a pair of J85 (probably −1) engines without benefit of afterburning. When, however, the −5 engines are "retrofitted" the M=1.3 capability should be comfortably achieved, since the afterburner augmentation is of the order of 50% under sea-level static thrust conditions.

Designed for the USAF Air Training Command to train pilots for such advanced aircraft of the near future as chemically fuelled and boost-glide bombers, and a new generation of Mach 3 fighters, the T-38 will supersede the Lockheed T-33 subsonic jet trainer and will have a performance capability up to Mach 2 (with normal engine power growth) to match the more recent century series fighters. By virtue of its much lighter 11,000-lb. gross weight, which stems from the high thrust/weight ratio of the smaller breed of turbojets, the T-38 will obviously cost much less to produce, fly and maintain than either the Lockheed T-33 grossing around 15,000 lb. or the massive complexity of the North American F-100F two-seater trainer in the 30,000-lb. class. By "obvious" in relation to production cost, we obviously refer to similar production runs, since it would be manifestly unfair to compare the tooling cost of a small initial batch of T-38s with that of, say, the T-33, already produced in considerable quantity and with tooling cost largely written off.

The T-38, formerly known by its company designation N-156T, is closely related to Northrop's new N-156F multi-purpose fighter now on the assembly line at their Hawthorn, Calif., plant and planned for flight testing in July. These plans are naturally based on the promise that the −5 afterburning engines will be available at the scheduled time; the airframe, from what we have seen, will be ready for its planned rollout from the assembly shop by the end of May. Inasmuch as the design of the N-156F fighter and the T-38 trainer have been proceeding in parallel and their construction is basically similar with about 80% of their components interchangeable, the successful initial flights of the T-38 also promise well for the N-156F. This particular lightweight fighter version, currently grossing 12,300 lb., is being aimed at the NATO and SEATO Powers outside the U.S.A. and its development for that purpose has recently been backed by the USAF with a preliminary seven million dollar contract for three prototype flight and one static test aircraft. The R.A.A.F. are known to be much interested in the N-156F as a replacement for their Avon-engined F-86s and Northrop are prepared to negotiate a licensing agreement with Commonwealth Aircraft Corp., of Melbourne.

The basic N-156 design theme—of which the T-38 might be considered the overture—has some unusual characteristics, a few of which may be briefly noted. Beginning with the wing, one might argue whether the planform follows the trapezoidal fashion of the Lockheed F-104 or whether it might be described as a clipped delta. Actually, it is a much more sharply tapered trapezoid than that of the F-104, with a tip/root chord ratio as pronounced as 0.27—which is probably why the short-span

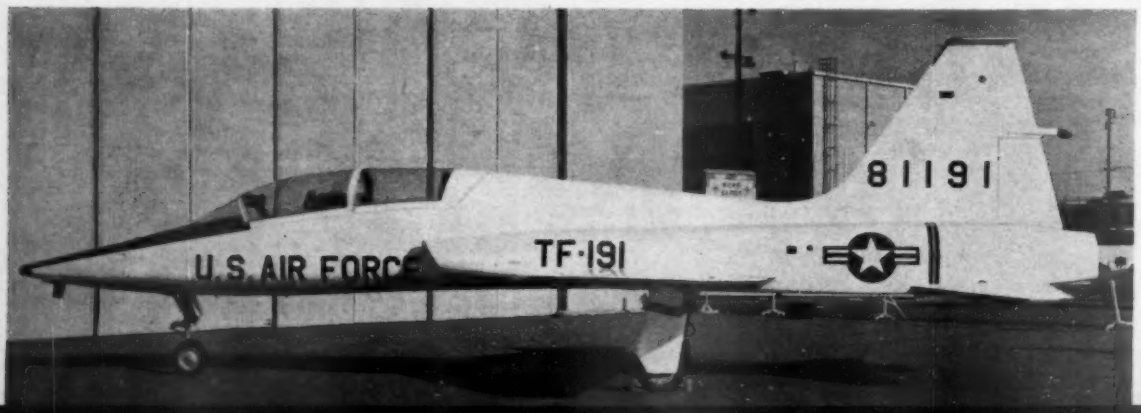


The T-38 is seen (above) in the flight-test condition with a nose instrument boom and temporary painting over the rear cockpit canopy. Below, the final Service form.

wide-chord ailerons are set well inboard of the wing tips. With a moderate "built-in" quarter-chord sweep of 25°, the thickness/chord ratio is a constant 4.8%. Wing area is 120 sq. ft. net and 170 sq. ft. gross (inclusive of the body gap). Because this is one of those pleasingly rare exhibitions of design finesse in a low-wing-body combination it is perfectly legitimate, on the evidence of extensive tunnel model experimentation, to accept the gross wing area as aerodynamically effective by virtue of clever fuselage profiling and a sensible as well as sensitive regard for the combined pressure pattern of the wing-cum-body. Instead of being treated as a parasitic appendage to the wing lift mechanism, the parasite has been put to work, so to speak.

Thus the fuselage is not only area-rule indented in plan for reduction of the transonic peak drag, it is also elegantly cambered (on the median lift line) in side elevation with a

(*Continued on page 577*)



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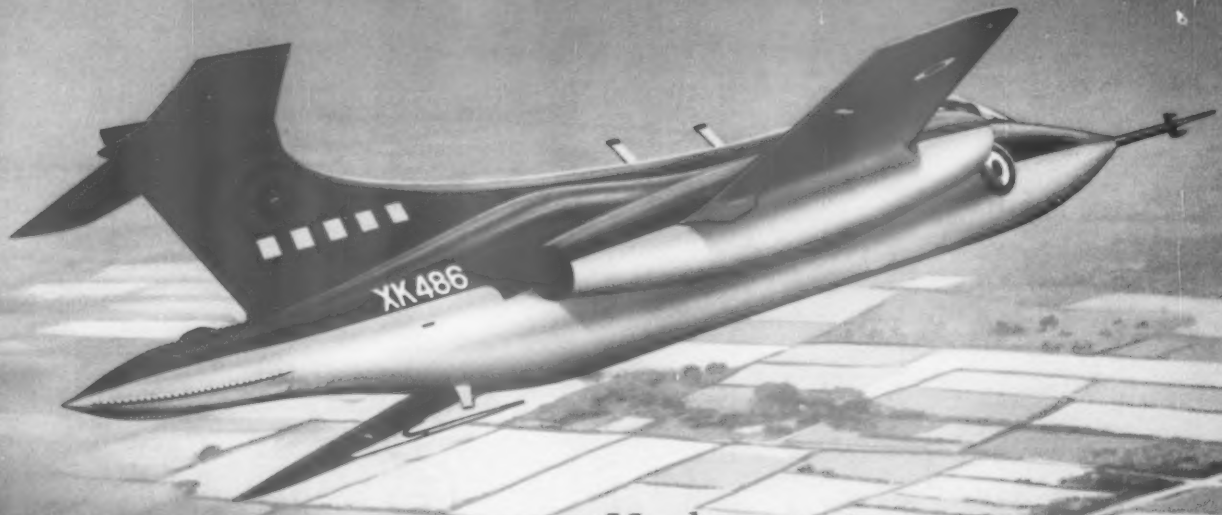

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The Talon is seen here with the mock-up of the N-156F fighter version, prototype of which is to be flown in July with J85-GE-5 afterburning turbojets. Sidewinder missiles are at the wing tips.

(*Continued from page 576*)

distinctive ventral concavity and upswept flat-bottomed afterbody. The designer, in fact, has turned the dual engine layout to full aerodynamic advantage, which is more than can be said of the great majority of twins—and especially so in the case of the pickaback layout imported from France, which is surely the clumsiest and most illogical layout of the lot. Such an arrangement gives the impression that one engine is being taken for an unremunerative ride—and to some extent it is, for it clearly results in a tight squeeze-play with the fuel tankage requirements, a difficulty that may lead to what might be called "bulge-and-bump aerodynamics," as may be witnessed from the contemporary scene. Here is an aerodynamic analogue to the more widely recognized weight-growth trend: Dean Swift's classic flea, with its descending order of parasites, has drag as well as weight encumbrances.

On the propulsion side, then, the T-38 has its pair of J85s mounted Siamese-wise behind the wing trailing-edge well aft in the fuselage, where a quick-detachable parting joint at the leading-edge of the horizontal tail permits ready access to the powerplant. (The horizontal tail comes away in the maintenance process, but the vertical tail remains *in situ*.) The individual engine aspiration systems are brought forward in long easy-curving ducts to form the wing-body waisting on each side, with the intake lips above and forward of the wing and proud of the fuselage skin. The boundary layer bleed is a vertical slit or port in the fuselage just behind the intake lip, with the bleed air sucked in and circulated through a heat exchanger, which is part of the air conditioning system located just behind the rear cockpit. Since the multi-spar wing is a dry one, all the fuel (580 U.S. gallons) is carried in bladder-type cells located in the fuselage between the engine air ducts.

In addition to the high thrust/weight ratio of 7.7 of the J85 turbojets—probably one of the highest in the afterburning small-diameter class between 20-24 inches—the logical twin-engine layout of the T-38 and N-156F, with their two independent fuel systems, possesses tangible "talents" in the way of safety and reliability in this supersonic and somewhat sulphurous jet age. Such an aircraft can complete its mission and land safely with one engine inoperative, thus eliminating a dangerous dead-wick landing with high fuel content or the emergency bale-out from an abandoned aircraft—a potentially lethal practice, not uncommon in the U.S.A., that can still blaze a funeral pyre for the earthbound innocent.

Summary—Northrop T-38 Talon

Function.—U.S.A.F. supersonic trainer for: (1) Supersonic flight up to Mach 2 capability. (2) Aerobatics. (3) Multi-jet engine operation. (4) Night flying. (5) Take-off and landing techniques. (6) Cross-country navigation. (7) Instrument let-down procedures.

Powerplant.—Two General Electric J85-GE-5 afterburning turbojets each rated at 2,500 lb.s.t. (dry), 3,650 lb.s.t. (afterburning) at sea-level. Fuel capacity (fuselage tanks only) 580 U.S. gallons.

Dimensions.—Wing span, 25 ft. 3 in. Length, 43 ft. 0 in. Height, 11 ft. 11 in. Wing area (net), 120 sq. ft. (gross, including body), 170 sq. ft. Aspect ratio (gross area, overall span), 3.75. Taper ratio (tip/root chord), 0.27. Thickness/chord ratio (constant), 0.048. Sweepback (25% chord), 25°. Dihedral, 0°.

Weights and Loadings.—Gross weight, 11,000 lb. Landing weight, 8,000 lb. Wing loading (gross area), 64.8 lb./sq.ft. Take-off thrust loading (afterburner on, T=7,300 lb.) T/W=0.66 lb./lb.

Performance.—Maximum speed (afterburner on), 860 m.p.h. (M=1.3) at 38,000 ft. Cruise speed, 590 m.p.h. (0.89 M). Landing speed (W=8,000 lb.) 133 m.p.h. Service (combat) ceiling, 55,000 ft. Maximum range (580 U.S. gals.), 1,200 statute miles.

Trainer into Tourer

A HIGHLY polished Chipmunk with a distinctive "Day-Glo" red-and-white trim has become a familiar sight at many airfields in the U.K., and particularly on the air route between Bristol and London. Registered G-AOTM, it is the personal mount of Mr. Peter G. Masefield, managing director of Bristol Aircraft, Ltd.

In recent months the contours of the Masefield Chipmunk have undergone progressive modification. This has not only improved its external appearance but has also increased its performance, comfort and touring potential. In its standard trainer form, the Chipmunk has handling qualities which are among the most delightful of any light aeroplane, but it offers little or no baggage space; the standard canopy fits rather tightly about the ears; and its performance is capable of further development.

One of the first steps in cleaning up the airframe was the addition of spats to the main undercarriage legs. The layout of these is such that the spats can conveniently cover only the mainwheels, leaving the lower part of the legs exposed, but for a weight penalty totalling only 6 lb., the glass-fibre fairings confer an increase of about 5 knots on the cruising speed. The spats are designed so that they will not clog on muddy airfields, and will prevent mud being thrown up on the undersurface of the wings and flaps. They are also suitable for installation on most other light aircraft.

Glass fibre was also pressed into use to replace existing metal fairings which were subject to fatigue cracking, including the spinner, spinner backplate and nose cowling. These components now have unlimited fatigue life, and the plastic spinner is 6 lb. lighter than the metal type.

A more obvious, and the most recent, modification was the replacement of the built-up sliding canopy by a moulded one-piece bubble hood. Using the original runners, and front and bottom canopy frames, the new hood is aerodynamically much cleaner, for improved performance; is quieter; higher, for more headroom, and offers an unrestricted all-round view.

On the top of the front screen of G-AOTM, Mr. Masefield

has mounted a Grimes rotating anti-collision beacon, which is visible in VMC up to 40 miles and, with the fluorescent paint trim, is offered as a conversion item with the other modifications. The beacon mounting also incorporates a useful rear-view mirror. As G-AOTM is used for a certain amount of night-flying, Mr. Masefield has had the interior painted white, for easier location of controls, and the instrument panel finished in light grey. The front cockpit has additional instruments, and a useful extra locker just forward of the floor-mounted compass.

Baggage space is now being provided between the main-spars of the inner wing sections, which will have ribs replaced by metal and glass-fibre panels, the upper forming a quick-opening lid with a zip-fastened closing strip. The resultant compartments are 24 by 18 by 8 in. in size.

The last requirement to make the Chipmunk a really useful touring aeroplane—increased range—is now being catered for by additional fuel tanks in the wings, which will bring the maximum capacity to about 64 gal. All the "Masefield" modifications to the Chipmunk, which have been developed in agreement with de Havillands and the A.R.B., are being made available commercially by Bristol Aircraft, Ltd.

Right, latest version of the pneumatic single-seat Goodyear YAO-3G "Inflatoplane," with an improved 44-b.h.p. Nelson H-63A flat-four engine, has a single-wheel undercarriage and is being developed under a joint Army/Navy contract.

New at Las Vegas

Howard Levy photographs

Above, among the varied armament displayed on a number of Super Sabres was this dual underwing installation of GAR-8 Sidewinder air-to-air missiles, on an F-100D.

Below, recently certificated by the F.A.A., the Hughes Model 269A two-seat helicopter is also being evaluated by the U.S. Army as the YHO-2HU. Power is a 180-b.h.p. Lycoming.

Left, first photograph of a production Bell HU-1A (one 825-s.h.p. Lycoming T53 gas turbine), of which 47 are on order for the U.S. Army. This example has a ferry tank in the rear cabin.

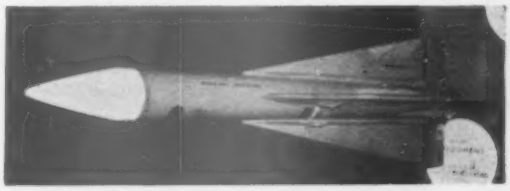
Below, rarely seen is the Martin B-57E Canberra, which is a dual-purpose target-tug/tactical bomber. It is fitted here with Radop gunnery targets beneath the wings, ready for streaming from the adjacent winches.

Astronautics and Missile News

THOR OPERATION.—On May 7, Mr. James H. Douglas, Secretary of the U.S.A.F., told a Senate committee that Thor IRBMs in Britain could be made operational whenever the British Government wanted this to be done. It had been decided that at present the missiles should be used for crew training, but that "if it is the desire of the two Governments to create operational capability at the expense of crew training, this could be done."

BRITISH GENIES?—A British Press report suggests that Douglas Genie nuclear AAMs may be supplied for the English Electric Lightning. The MB-1 Genie is an unguided missile with a solid-fuel motor whose warhead will destroy aircraft within a radius of at least 2,500 ft. from the detonation point. Its basic cost is given as about $7,000, but the addition of the warhead increases this to approximately $250,000 per missile.

SATELLITE POWERPLANT. — A satellite powerplant measuring only 8 in. by 6 in. by 3½ in. has been developed by the Allison Division of General Motors. Using solar or nuclear energy as fuel, this closed-cycle heat engine is rated at nearly 40% thermal efficiency and can operate unattended for long periods; it develops 3-5 kW.



LATEST FALCON.—The Hughes GAR-3 Super Falcon AAM, with semi-active radar homing system, operates higher, faster and farther than its predecessor.

Howard Levy photograph

NO VENUS PROBES.—Plans to launch probe vehicles towards Venus in June have been abandoned "because of technical difficulties," says NASA. The next favourable time would be about January 13, 1961.

SOVIET TWO-MAN SATELLITE?—Dr. S. F. Singer, Professor of Physics at the University of Maryland, has predicted that Russia may attempt to orbit a two-man satellite this summer.

PROJECT VEGA. — Convair Astronautics have been awarded a $33,500,000 contract for the design, construction, testing and launching of eight Vega rockets by 1962. The Vega will comprise an Atlas Series D, a modified General Electric Vanguard engine, and a 6,000-lb. thrust JPL third stage using storable propellents. It could be used to orbit a 5,000-lb. space laboratory at 300 miles (accommodating two or three men for several weeks), or for various unmanned lunar and planetary missions.

DELTA ROCKET.—Basically a Thor-Able three-stage rocket, the new Delta variant features an improved radio inertial-guidance system, and "active guidance control of longer coasting periods between second-stage cut-off and third-stage ignition." Twelve Delta vehicles are being built for use in 1960-61 for Earth-satellite and deep space missions.

MRS. V.—With the object of developing "piloted combat vehicles that can manœuvre in space like fighter planes in the atmosphere," Rear Admiral John Clark, Deputy Director, ARPA, U.S. Department of Defense, has revealed the existence of a long-term project called MRS. V. (Manœuvrable and Recoverable Space-Vehicle).

FOURTH TITAN TEST.—The fourth launch of a Titan ICBM was made at Cape Canaveral on May 4; all Titan launches to date have been successful.

SPACE-MICE.—Next month the U.S. hopes to launch into orbit—and recover—a 35-lb. satellite containing four white mice.

HOUND DOG.—Two of these North American supersonic ASMs, with underslung J52 turbojet, are carried by the Boeing B-52G.

General Aviation News

SARO VARIANTS.—Both prototypes of the Saro P.531 helicopter flown so far are of the P.531-0 type, and a small batch of these is now being built for Royal Navy evaluation trials. One of the prototypes is being converted to P.531-1 standard, with strengthened transmission rotor systems, and will then serve as the prototype for the first planned production version, with a 425-s.h.p. Blackburn Turmo 603 turbine. Several of the production P.531-1s will be set aside for development of the P.531-2, which will have a 1,000-s.h.p. turbine de-rated to 650 s.h.p. and a gross weight of about 5,000 lb.

B-58 FIGURES.—Latest information issued by Convair on the B-58 Hustler quotes a span of 56 ft. 10 in.; length, 96 ft. 9 in.; height, 31 ft. 5 in.; and wing area of 1,542 sq. ft. The fuel capacity is more than 15,000 U.S. gal. Four 10,000-lb. J79s, plus afterburners, are fitted.

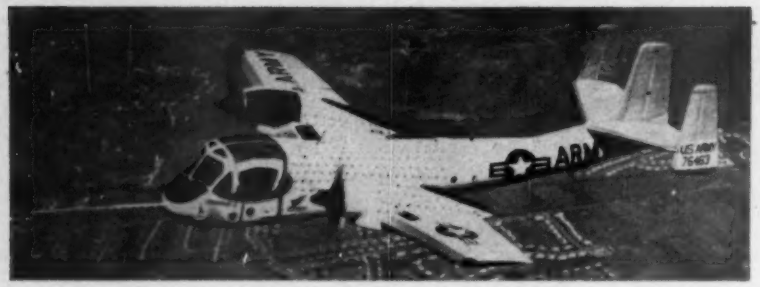
COMET RECOGNITION. — The Worshipful Company of Carmen has announced that the VIVA Shield, Gold Medal and Citation for 1958 has been awarded to the de Havilland Comet. The shield is held for 12 months and is presented for the most outstanding contribution to national transport. It will be presented in July.

VANGUARD HOURS.—The prototype Vickers Vanguard is now undergoing inspection and preparation for its next series of flight trials, having completed 120 hours since January 20. The second aircraft has logged 20 hours up to the time of its visit to Hamburg on May 6 (see page 568).

NEW GERMAN HELICOPTER.—Display of a complete transmission and rotor system on the Hirth stand at the recent Hanover Fair suggests that a new German small conventional helicopter is being developed. The company concerned is said to be Merckel of Odenheim.

X-15 COCKPIT.—Attitude controls for use during ballistic flight are a novel feature of the North American X-15's cockpit. These (on left of cockpit) regulate gas supply to attitude-control puff pipes. Unconventional instruments include a rate-of-roll indicator (lower centre) graduated up to 200°/sec.

Howard Levy photograph



ALOFT.—Seen here on its first flight, the Grumman YAO-1 Mohawk (two 1,005-e.s.h.p. Lycoming T53-L-3 turboprops) has a tufted upper surface for visual aerodynamic flow pattern observation. Nine prototypes are being built for the U.S. Army; another 35, designated AO-1AF, will follow.

CHEAPER TURBULENT. — Batch production has allowed Rollasons to reduce the price of the standard model of the Turbulent single-seater; with standard 31-h.p. Ardem 4CO2 engine it now costs £945 ex-works. Two new versions with higher performance are announced: one with the 34-h.p. high-compression Ardem (£970), and the other with the 38-h.p. Ardem with FH mod. (£1,040). All models can be fitted with windscreen crash pylon for an extra £12, and other optional extras include engine and cockpit covers, tail "anchor," rudder clamps and tie-down gear. It is still possible to offer delivery before the end of the present season if orders are received immediately.

LAS VEGAS FIGURES.—There were more than 6,000 registrants for the World Congress of Flight, including representatives of 51 nations; 217 U.S. and foreign firms had exhibits which were visited by more than 64,000 people on the two public showing days alone. Over 500 newsmen registered, of which 36 were from other nations; 7,500 persons saw the air demonstrations and fire-power show at the Gunnery Range on April 15. By way of comparison, at the last S.B.A.C. show at Farnborough, attendance on the three public days totalled 228,000.

CANADAIR COMMITMENTS. — More than half the 37 Canadair CL-28 Argus maritime-reconnaissance aircraft on order for the R.C.A.F. have been delivered; additional orders may be forthcoming. The transport version, the CL-44, is also being produced to re-equip one R.C.A.F. squadron—probably No. 426—and a similar quantity of Eland-powered Canadair 540s is on order for military use. The airframes of two CL-41 trainers have been completed for some time, but because of the cancellation of the Fairchild J83 turbojet, these will now be fitted with Pratt & Whitney JT-12s.

Commercial Aviation Affairs

C.P.A. BRITANNIA SERVICING.—A contract to carry out Check 4s on the six C.P.A. Britannias has been concluded between Bristol Aircraft, Ltd., and C.P.A. The first aircraft arrived at Filton on May 4 and will be ready for return in a month. The contract involves about 15,000 man-hours per aircraft.

COMET TEN.—The 10th Comet 4 for B.O.A.C. was delivered to L.A.P. on May 6, some two months ahead of schedule.

DC-8 PLUS AND MINUS.—K.L.M. is negotiating for the purchase of four more Douglas DC-8s, making 12 in all. The four new DC-8s would use turbo-fan engines and would be the first of this version ordered. Philippine Air Lines is also reported to be ordering two DC-8s. Eastern Air Lines has cancelled four of the 20 Douglas DC-8s it had on order.

ATLANTIC INCREASES. — During the first quarter of this year scheduled passenger traffic over the North Atlantic increased by 19.9% to 190,894 and cargo increased by 30.3%. Nearly 65% of the passengers travelled economy class.

J.A.L. TRANS-PACIFIC Japan Air Lines will serve Los Angeles and Seattle in addition to San Francisco following U.S. approval of their application. Service to Los Angeles via Honolulu will begin on June 1 and to Seattle over a Great Circle route on July 1. United Airlines has contracted to supply 10-20 captains, first officers and flight engineers to supplement J.A.L.'s own flight personnel for a year.

IRAQ RESTRICTIONS.—On May 6, Iraq ordered the closing of all civil airports between 19.00 hrs. and 05.00 hrs. daily. Similar restrictions on flights by civil aircraft over Iraq were already in force. On May 6 also, Alitalia announced that one of its DC-6s on a flight from Teheran to Rome had been forced to land at Baghdad.

ALLISON OVERHAUL.—The F.A.A. has approved a 1,000-hr. overhaul life for the Allison 501D-13 turboprops in Eastern Airlines' Electras.

SHANNON BRITANNIAS. — On May 7, B.O.A.C. returned to Shannon Airport after seven years. Britannias on one weekly service (and, from May 19, two) between London and Detroit and Chicago now call at the Irish international airport, where Mr. George Angell has been appointed B.O.A.C. manager.

P.A.A. REVENUES.—Pan American operating revenues in 1958 were £111,857,150, some £170,000 more than in the previous year. Net income for the year, however, at £1,821,430, was more than £1,000,000 less.

K.L.M. LOSS.—In the first quarter of 1959, K.L.M. recorded a loss of Fls. 8.2 million, compared with Fls. 7.3 million in the same period last year. The loss of traffic from Indonesia was one of the reasons for the increased deficit.

FALCON AIRWAYS.—Capt. M. K. Kozubski, managing director of Falcon Airways, Ltd., wishes us to state that, contrary to the impression which may have been given in a caption to this picture on p. 557 of last week's issue, his company has no connection with Independent Air Travel, Ltd.

News About People

R.A.F. APPOINTMENT.—H.M. The Queen has approved the appointment of the Shah of Persia to the R.A.F. in the honorary rank of Air Chief Marshal. The Shah received the warrant during his State Visit last week.

G.Q. REORGANIZATION.—Following the death of Sir Raymond Quilter, Bt., Mr. Edward Baldry, O.B.E., F.C.A., who has been associated with the G.Q. Parachute Co., Ltd., of Woking, for many years, has been appointed a director and chairman of the company. Mr. Arthur C. Dickinson, A.C.A., a director since the company's inception, has been appointed managing director; Mr. James Gregory, formerly works manager and now chief designer, and Air Marshal Sir Gordon Harvey, K.B.E., C.B., R.A.F.(Retd.), are made additional directors.

SWISSAIR APPOINTMENTS.—Mr. Ian McPhail has been appointed Swissair's manager for Scotland. He is replacing Mr. P. Kessler, who is returning to Swissair's head office in Zürich as assistant to Mr. F. Kretz, the general sales manager. Swissair have also appointed Mr. E. Tanner, previously with the company in Zürich, to be their station supervisor at Manchester Airport. He is replacing Mr. B. F. Grivel, who is returning to Zürich.

IRISH DIRECTOR.—Mr. John C. O'Conner, F.C.A., has been appointed a director of Aer Rianta and Aer Lingus. He is a member of the council and a past president of Cork Chamber of Commerce; vice-chairman of Cork Economic Development Association and a member of the Advisory Committee of Coras Trachtala Teoranta. He is also a director of a number of other Irish companies.

SKYWAYS LOSS.—The death took place suddenly, on May 3, of Mr. E. Barker, financial controller to Skyways, Ltd. He was financial controller of the Eric Rylands Group of companies and a director of Samlesbury Engineering.

FIFTY YEARS.—Blackburn Aircraft held a jubilee dinner in Hull on May 1 to commemorate Mr. Robert Blackburn's entry into aviation. Mr. Eric Turner was in the chair.

CHANGES AT BRADFORD.—Mr. G. Colin Hepworth has been appointed managing director, engine components division, of Associated Engineering, Ltd., and will control the engine-component manufacturing companies of the British Piston Ring Co., Ltd.; Hepworth and Grandage, Ltd., and its subsidiaries; Wellworthy, Ltd.; Associated Engineering (Sales), Ltd.; Reid Watt Sales, Ltd.; and the group's overseas manufacturing companies. He relinquishes his seat on the board of Hepworth and Grandage. Mr. Jack L. Hepworth, previously joint managing director of Hepworth and Grandage, now becomes chairman and sole managing director of that company and its subsidiaries.

AIR TRAINERS.—Mr. Norman Hill, who recently joined Air Trainers Link, Ltd., of Aylesbury, as head of the sales division, has been appointed a director. The new head of the industrial products division is Mr. D. P. Markham.

GLIDING RECORD.—The British out-and-return record for two-seat sailplanes was broken on May 4 by Mr. W. Kahn and Mr. V. Gallie in a Slingsby T.42 Eagle. They flew from Lasham to Nympsfield and back—131 miles.

HESTON MANAGEMENT. — Mr. D. E. Stewart, B.E., A.F.R.Ae.S., has been appointed general manager of Heston Aircraft and Associated Engineers, Ltd., of Heston Airport, and is shortly to be elected to the board. From 1948 to 1955 he was technical superintendent of Australian National Airways, after which he joined Bristol Aircraft as Britannia development manager, and was later manager of Britannia production.

MR. H. J. STIEGER.—Nominated as the next Sheriff of Hull is Mr. H. J. Stieger, who had a long association with the aviation industry. The appointment is subject to confirmation. A native of Zürich, Mr. Stieger came to Britain in 1924 and served with Beardmore's aviation department. Later he founded the Monospar Co., and then General Aircraft, Ltd. In 1934 he flew in a Monospar ST.10 which he designed, with Flt. Lt. H. M. Schofield, to win the King's Cup.

LEC ACCIDENT.—We regret to record that four people were killed when a Dove 2A, G-ALEC, belonging to Lec Refrigeration, Ltd., crashed near Maindy athletic stadium, Cardiff, on May 6. They included the pilot, Mr. Paul Chambers. The aircraft had just been acquired to replace an Anson formerly operated by the company.

SALES AT POOLE.—Mr. A. A. Morris has been appointed sales manager of Northey Rotary Compressors, Ltd., of Parkstone, Poole, Dorset.

Military Aviation Affairs

R.A.F. IN TURKEY.—In Nicosia on May 7 timely congratulations by Air Marshal Sir William Macdonald, C.-in-C., Middle East Air Force, were offered to the R.A.F. mountain rescue team who reached the wreckage of the Super Trader which crashed on the 14,000-ft. Suphan Dag, Turkey, on April 23. The 17-man team was led by Flt. Lt. R. Robertson, who had the highest praise for his men and for the Cyprus-based Hastings which dropped supplies, and for the Turkish helicopter pilots. The equipment which the Super Trader was carrying to Woomera was destroyed with ice-axes and dynamite.

WORLD TOUR.—The present round-the-World trip by a Shackleton MR.3 of No. 201 Sqn. commanded by the C.O., Wg. Cdr. J. G. Roberts, D.F.C., D.F.M., is planned to cover 24,270 miles. Demonstrations will be made in India, Singapore, Australia, New Zealand, the United States and Canada, and the total flying time involved is expected to be 180 hr.

ARMY TYPE.—The Brantly B-2 helicopter for the U.S. Army is designated the YHO-3. Five are being delivered for evaluation.

JET DISTANCE.—It is announced in Washington that a Boeing B-52G of the U.S. Strategic Air Command made a non-stop flight of more than 9,000 miles on December 15 last without refuelling. It flew back and forth across the U.S.A. for 18 hr., averaging 500 m.p.h., and landed with ample fuel reserve. S.A.C. has placed some of these aircraft on constant airborne alert. The B-52G can carry H-bombs and North American Hound Dog ASMs.

NIGERIAN CELEBRATIONS. — Three Vulcan B.1s of No. 101 Sqn. (Wg. Cdr. A. C. L. Mackie) and a Comet 2 of No. 216 Sqn. (Wg. Cdr. R. G. Churcher) will represent the R.A.F. at the Regional Self-Government celebrations in Northern Nigeria this month. Led by Air Vice-Marshal G. A. Walker, A.O.C., No. 1 Group, the detachment is to arrive in Nigeria on May 15, and be based at Kano for five days.

END OF SERVICE.—The last two Sunderlands in the R.A.F. are scheduled to cease operations on May 15. Belonging to No. 205 Sqn. (Wg. Cdr. R. A. N. McCready) and operating from R.A.F. Seletar, Singapore, the two flying-boats have been replaced by Shackletons. With the longest period of squadron service—a few weeks short of 21 years—in R.A.F. history, the first Sunderland left R.A.F. Pembroke Dock on June 9, 1938, for delivery to No. 230 Sqn. at Seletar. Altogether 721 were built.

FOR THE R.A.F.—The first picture of a production Bristol 192 (two Napier Gazelles) in Service markings. This is the second production aircraft.

News of Industry

Kelvin House

AS recorded in our issues of January 30 and February 27, S. Smith and Sons (England), Ltd., has set up a co-ordinating board to direct the policy of the aviation, marine and industrial units of its Group, and to house the administrative staff the company has built new headquarters at Wembley. Known as Kelvin House, this office block was formally opened on May 4 by Sir David Eccles, President of the Board of Trade, who also inspected a representative exhibition of the products of the new Aviation and Marine Divisions.

In welcoming Sir David, Mr. G. B. G. Potter, managing director of Smiths Aviation and Marine Divisions and Kelvin and Hughes, Ltd., said that the interests associated in Kelvin House comprised, a few years ago, six separate companies, all either ploughing their own furrow or, on occasion, actively in competition. Comparatively recently it was realized that their businesses were more complementary than competitive, and that they had plenty of competition from other sources, particularly overseas, and so had much to gain and little to lose by association.

The net result is an association of firms today which is a world force in the instrument industry instead of six separate entities which singly had not the strength necessary for survival. Sir Aubrey Burke, president of the S.B.A.C., proposed the vote of thanks to Sir David for performing the opening ceremony.

The various aviation units in the Smith Group, which are now known, together with the Kelvin and Hughes business outside the aviation field, as Smiths Aviation and Marine Divisions, include Smiths Aircraft Instruments, Ltd., Waymouth Gauges and Instruments, Ltd., Kelvin and Hughes, Ltd., and subsidiary companies, and that part of S. Smith and Sons (England), Ltd., devoted to the manufacture or sale of aviation and allied products. In total this part of the Smiths Group employs some 8,000 people in factories in London, Cheltenham, Basingstoke, Glasgow and Godalming; over 50% of its products go to overseas markets.

Each company guided by the new divisional board continues to function as a separate entity, but its long-term policies are decided by the new board.

Recording Flight Behaviour

FOLLOWING nine years' experience in the manufacture of magnetic tape recorders for aircraft research and development work on behalf of the Ministry of Supply, Royston Instruments, Ltd., has produced a flight recorder designed for airline and general aircraft use. Recently introduced by the company's managing director, Mr. K. Dobson, the recorder meets the basic specification laid down by the European Airlines Electronic Committee for such equipment and it is understood that B.O.A.C. has shown particular interest.

Expected to be flying in a Corporation aircraft later this year, the instrument can be used for recording any engine parameter, instrument reading or airframe loading which can be transformed into an electrical signal. Designed for continuous operation from engine start-up to the completion of the flight, the recorder's most outstanding possibilities would be in the event of a major accident or aircraft structural failure; for the crash case automatic ejection from the aircraft is available.

The recorder is fitted with seven separate signal channels, each with a sampling rate of 70/sec., along with a timing channel providing a standard timing signal which can also record an aircraft code number, the date, the flight number and G.M.T. A time-sharing switch unit, operating at any sampling rate chosen down to one sample in 5 sec., permits the extension of the total number of channels up to 320. The recording time per tape cassette is approximately 150 hr. and the estimated overall life of the flight recorder will be 2,000 hr. Mounted in one case the recorder unit and power pack have a total weight of 40 lb.

Shell Looks to the Future

WITH large civil aircraft travelling higher, farther and faster over the World's air routes, the business of providing them with the necessary fuel both in quantity and in quality is by no means a simple extrapolation of existing methods. In fact, although one tends to take aviation fuel very much for granted as a vital fluid that is pumped into the aircraft's tanks as required, there is as much research needed for continual development of fuel technology as there is in others. Both in regard to the fluid itself and the methods of handling it, those who specialize in these matters devote a great deal of time and spend large sums of money in their efforts to seek improvements to match development of the vehicles in which their products are used.

At Thornton-le-Moor, in Cheshire, for example, the Shell company has a large research centre which deals exclusively with the "performance" aspects of their oil products. A sizeable part of the work done at Thornton is in relation to aviation fuels and oils and recently we were afforded an opportunity to see something of the research that is being done to solve problems that are likely to be pressing in the next few years.

One of the principal of these problems is brought about by the increasing demand for higher rates of flow during refuelling operations. The quantities of fuel carried in a present-day jet airliner are already sufficiently large to demand refuelling at the rate of 1,000 gal./min. if turn-round times are to be kept within the practical passenger handling limits. Even higher rates are likely to be required in the future.

To dispense this amount of fuel special equipment and techniques have had to be devised. One of the latest developments in this direction is the hydrant system of refuelling in which the fuel tanks and pumping arrangements are housed away from the main airport buildings and permanent underground fuel lines are taken to the aircraft parking area. All that is needed for refuelling at the aircraft end is a "dispenser" truck which connects the hydrant to the aircraft and incorporates microfilter, pressure control valve and fuel metering equipment.

The latest dispenser unit developed by the Shell team for use with hydrant refuelling can transfer fuel at the rate of 600 gal. per min. It can be operated by one man and has a pneumatically raised ladder with a sensing device on it which applies the brakes as soon as contact with the aircraft is made.

Increasing the rate of fuel flow brings with it an increase in the possibility of a sizeable electrostatic charge being given to the fuel in the tank. This is no new problem; but at present electrostatics can quite easily be dealt with.

The root of the problem is that the conductivity of kerosene is comparatively low and the charge dissipates more slowly than it builds up at high flow rates. There are, of course, mechanical methods of speeding the charge dissipation but the most satisfactory solution would be to increase the conductivity of the fuel. For example, Shell have an anti-static additive—composed of salts of chromium and calcium—which can be added in the proportion of two parts per million. We were shown a simple laboratory demonstration of the remarkable effectiveness of a minute quantity of this additive.

Another problem associated with high refuelling flow rates is that of surge in the pipelines after a valve shut-off at the aircraft tank. This can be violent enough to cause damage and a good deal of hydraulic shock research is being undertaken at Thornton.

One method of alleviating these hydraulic shocks is to use special valve-control gear to isolate the aircraft system from high upstream surges. The other is to use pneumatic shock absorbers which in effect increase the elasticity of the fluid in the system and reduce the magnitude of the shock created.

Cleanliness is all-important in aviation fuel and research into methods of filtration forms an important part of the work at the Shell research centre. These problems have become accentuated with the trend towards higher fuel pressures and closer tolerances in the powerplant fuel system. Studies are being made of the means of minimizing the amount of solids in the fuel—even including particles as small as 1-2 microns.

Avoiding water contamination is a problem of a different sort but equally important. Here, Shell have developed an ingenious monitor valve for the main ground refuelling supply system which automatically cuts off the supply if water is present in the fuel. This equipment is a form of double insurance against mechanical failure or human error, and is scheduled to go on field trials in the near future.

For manual inspection purposes, Shell have devised a small "pocket type" water detector in the form of a syringe which takes up 5 c.c. of fuel through a pad impregnated with potassium ferricyanide and ferrous ammonium sulphate which turns green if water is present; it reacts at a contamination of 30 parts per million.

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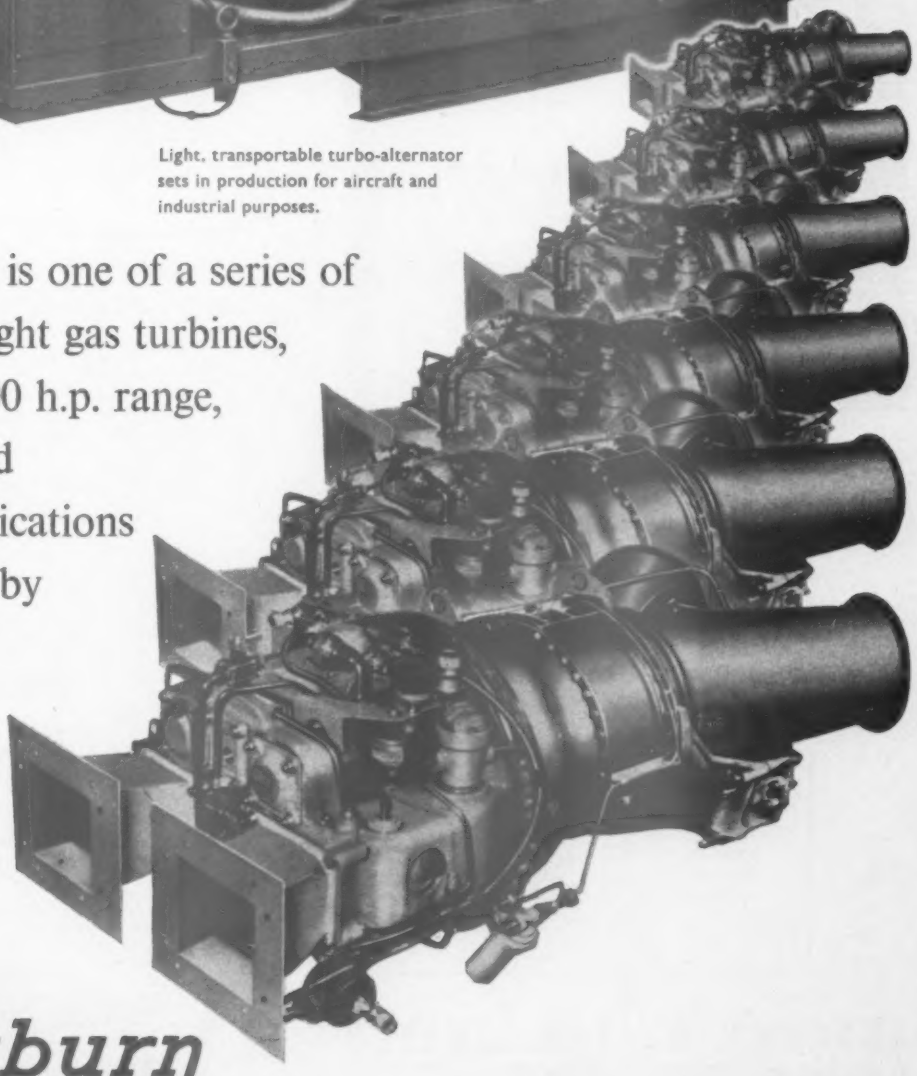

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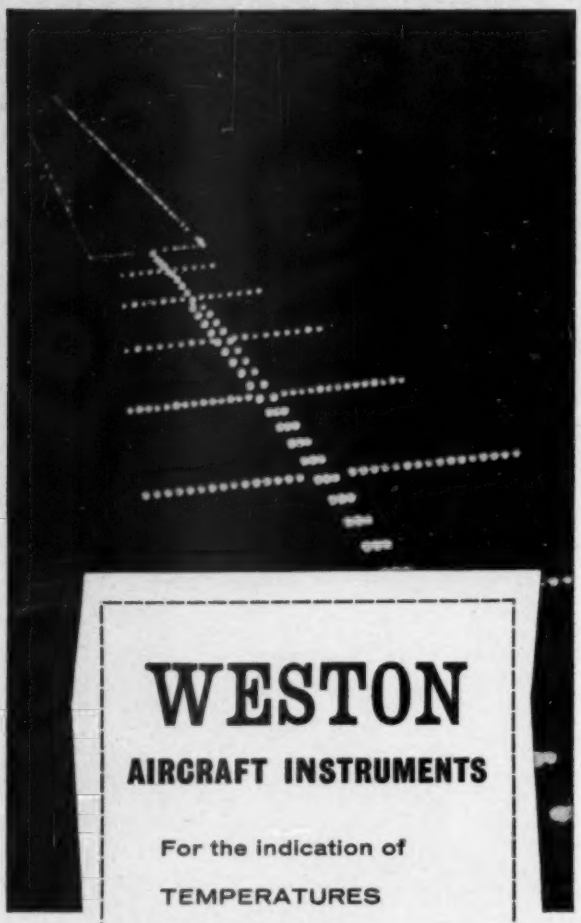

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Correspondence

From Air Marshal Sir Robert Saundby, K.C.B., K.B.E., M.C., D.F.C., A.F.C. R.A.F. (Retd.).

Pre-war Service Planning

AS I have recently returned from abroad, I have only just seen Mr. Basil Collier's letter in your issue of April 24, under the heading "Defeating the Bomber Boys." Mr. Collier says that "we were in a position to win the Battle of Britain largely because in 1938 Sir Kingsley Wood, advised by Sir Thomas Inskip, insisted in the teeth of the 'bomber boys' that production of fighters should have priority over that of bombers."

I held three senior posts in the Air Staff at the Air Ministry from the beginning of 1937 to the end of 1940, and I do not believe that there is any foundation for that statement. It is true that Trenchard laid down that A.D.G.B. should have one-third fighters and two-thirds bombers. He took the view that if we had a sufficiently powerful bomber force, and could seize the initiative, the air war would be fought from the outset over the enemy's country and not over ours. In fact, when Bomber Command had sufficient strength, the air war moved into German skies and stayed there. There is no doubt that Trenchard was right.

In 1938 there were no "bomber boys," if that name is meant to describe the fanatical proponents of bombing at all costs. When it became apparent that our bomber force could not be built up in time, we were forced to adopt a defensive policy. Since we were too weak in bombers to be able to avoid the Battle of Britain, we had to have it, and win it. The decision was taken by the Air Staff, if not unanimously, at least *nem. con.*

R. SAUNDBY

Burghclere, Newbury, Berks.

From Maj.-Gen. H. J. Parham, C.B., C.B.E., D.S.O. and Bar.

Canada's Anniversary

WITH reference to the photograph on page 269 of THE AEROPLANE for March 6 last, showing the Silver Dart replica flying at Baddeck, Nova Scotia, in the hands of Wg. Cdr. P. Hartman, is there any chance, I wonder, of a handling report forthcoming from this pilot? It would be most interesting to know how much "faking" had to be done to get the longitudinal stability adequate for the present-day flights.

Ipswich. JACK PARHAM.

Blackburn History

IN your very interesting and informative article "Fifty Years of Blackburn Aeroplanes" (THE AEROPLANE AND ASTRONAUTICS, May 1) I am sorry to see that you have omitted any reference to the Roc. This was, in effect, a turreted version of the Skua, utilizing our Type A four-gun turret, and the design was elaborated by us in close collaboration with Blackburns, many of the detail parts being interchangeable with those on the Skua. A total of 136 Rocs were ordered in April, 1937, and all were built by us, the last of them being delivered in August, 1940.

Wolverhampton. W. J. PICKTHORN,
Boulton Paul Aircraft, Ltd.

[Reference to the Roc was omitted as it was specifically a Skua variant and was not built by Blackburn. Boulton Paul Aircraft, Ltd., did, incidentally, receive full credit for Roc production when we featured their 40th anniversary in THE AEROPLANE of July 8, 1955.—ED.]

Munich Aftermath

YOUR brief note in THE AEROPLANE AND ASTRONAUTICS for April 24 indicates that an independent assessment will be made in relation to the Munich disaster and the question of the pilot's licence suspension. It will certainly be interesting to see how "independent" this inquiry is and what rights the pilot will be accorded as regards representation.

It seems high time that the legal position in this matter was stated. The Captain of an aircraft is required by law to inspect his wings for ice before take-off. All legislation states the maximum penalty which may be imposed for breach of it and in this case the maximum penalty is £200 fine or six months in prison or both.

If the Minister is convinced that the pilot of this aircraft failed in his legal responsibility then his course is clear; he must prove his contention before a court of law. What better independent assessment can there be and what are our law courts for?

Suspension of a licence is not a penalty which may be imposed for this or any other offence, if the laws of aviation have any meaning. The Captain of this aircraft has already been separated from his professional activities for over a year due to administrative delays, which is far worse for any pilot than the maximum penalty quoted.

Woodford Green, Essex. R. H. AYERS.

Wroundabout

From My Favourite Line Book

An R.A.F. pilot was taking aspirins with his coffee. His signaller explained: "Our crew's been on the ground so long that a ten-millibar pressure drop gives us a headache."

*

PROtective Position Sought. Farnborough have at last given their airfield control chaps an all-round view by moving them into a new glass-house on top of the famous control tower. But where will the S.B.A.C. Display commentator now operate from? Oliver Stewart says he doesn't much mind where it is, as long as the Industry's P.R.O.s can't get at him.

*

Soar Point. Frank Irving, mild and bespectacled and one of our leading glider pilots, landed in a smooth, carefully raked field after a recent flight. In due course, spectators came stamping in and the crew car and trailer arrived. Later, as all were leaving, Frank apologized to the farmer for the shambles and asked if there was anything he could do to repay. "Yes," said the farmer and handed the aeronaut a large rake. An hour later, Frank straightened his aching back and swore he'd be more selective in his future landings.

*

IATA Charter. This column's recent reference, in a drawing, to an "IATA tax," has drawn from Ralph Cohen, IATA's Public Relations Officer, a touching response:—

"Dear Wren,
Let's face the facts,
This game is not all honey.
There is no IATA tax,
The airlines *need* the money!"

*

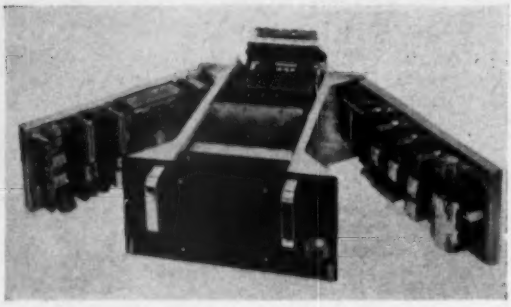
"No, no, dear—it's just wind." In Oklahoma a cow died after eating a U.S.A.F. weather balloon which came down in its pasture.

*

"Well Sir, I always take heart from page 23 in the excellent R.A.F. Games Handbook—it defines a sportsman as a cheerful loser, valuing the game more highly than the result."

by Wren

NOTES AND EVENTS



ARINC SPECIFICATION.—The Decca Navigator Mk. 10 Receiver has now been re-engineered to the ARINC specification to fit American aircraft racking; the new receiver will be known as the Mk. 10.A (Type 900). The case size is 1½ A.T.R. and the weight 42 lb., a saving of 7 lb.

INSIGNIA AWARDS.—The City and Guilds of London Institute established the Insignia Award in Technology in 1952 to help meet the national need for technologists qualified to occupy positions of special responsibility. A booklet giving details of the award, with notes for the guidance of candidates, is obtainable free from the director (I.A.) of the Institute at 76 Portland Place, London, W.1.

FOR PRIVATE PILOTS.—The 1959 edition of C.A.P. 53—The Student Pilot's and Private Pilot's Licences—is now available from H.M.S.O. at 2s. 6d., or 2s. 8d. by post. It now includes details of Instrument Rating requirements.

BEECH REPRESENTATION.—De Havilland Pty., Ltd., Bankstown aerodrome, Sydney, has been appointed Australian representative of the Beech Aircraft Corpn. of Wichita, Kansas.

JET-FUEL HANDLING.—The Esso Research and Engineering Co., is developing methods for the quicker fuelling of large jet transports through the use of test equipment simulating airport conditions. At the company's Linden, N.J., establishment a mock-up of an airport fuelling system and a transport's wing tanks is being employed for such tasks as reducing supply pressures without lowering fuel-flow rates.

SIMULATOR DELIVERED. — The recently completed Solartron 10-target early-warning and height-finding radar simulator for the R. Swedish A.F. was delivered to the R. Swedish Air Board last month. The Solartron Electronic Group is supplying this type of system to four European Governments.

METAL COATINGS.—The European Metal Finishing Division of Roto-Finish, Ltd., is now introducing new chromate conversion coatings for zinc, cadmium, aluminium and magnesium. These range from transparent and colourless coatings on zinc and cadmium to coatings which, except for magnesium, may be dyed a variety of colours for identification purposes. The coatings have a high degree of corrosion resistance.

RADAR CONTROL.—Four Marconi 50-cm. terminal area radars are shortly to be installed at Geneva, Ostend, Kai Tak (Hong Kong) and Dum Dum (Calcutta). At Geneva the Marconi 50-kW. surveillance radar Type S264 is to be fitted, and Ostend is to have the company's Type S232 radar. A type S264 radar is to be installed at Hong Kong on high ground above the harbour and the radar information transmitted to the airfield by microwave link; a Type S232/1 radar has been ordered for Dum Dum.

SERVICE GUIDE.—The Pyrene Co., Ltd., of Brentford, Middx, has published a guide to the services available from its Metal Finishing Division. These cover engineering advice on the company's processes, and after-sales and laboratory services. In addition to its head office and works at Brentford, the company has regional offices in a number of industrial areas.

SEARCH RADAR.—Ekco Electronics, Ltd., of Brentford, Middx, has published radar with Doppler drift-measuring equipment for the Viscounts of Kuwait Airways. This follows recent orders for similar equipment from the Lebanon and Iraq.

Aviation Calendar

May 16-31.—National Gliding Championships organized by Austrian Ae.C., at Zell am See, near **Salzburg,** Austria.

May 17-18.—Whitsun Week-end organized by Auto-Sport, Ltd., at **Ramsgate Airport,** Kent.

May 17-19.—International aeroplane sales fair, at **Cosne sur Loire,** Nièvre, France.

May 18.—R.A.F.A. (Eastern Area) air display, at **Hucknall aerodrome,** Notts.

May 18.—S.S.A.F.A. air display, at **Leeds/Bradford Airport.**

May 18-29.—University of Rome/AGARD lectures, "Astronautics and Space Sciences," in **Rome.**

May 20.—R.Ae.S. Brough Branch film show, in the flying club lecture room, **Brough,** at 17.10 hrs.

May 21.—Women's Engineering Society London Branch lecture, "Aerial Survey Methods," at Hope House, 45 Great Peter Street, **London,** S.W.1, at 19.00 hrs.

May 23-25.—Fifth air touring rally organized by Quiberon Ae.C., at **Quiberon,** France.

May 24-31.—Rally of the Stars, organized by the Milan Aero Club, at **Milan.**

May 25-June 2.—F.A.I. annual conference, in **Moscow.**

May 27.—R.Ae.S. Hatfield Branch, A.G.M., in the de Havilland restaurant, **Hatfield,** at 18.15 hrs.

May 28.—R.Ae.S. Southend Branch, film show, at the Labour Hall, Boston Avenue, **Southend,** Essex, at 19.30 hrs.

May 30-31.—Sixth Dauphine Aéro Club rally, at **Grenoble,** France.

May 30-June 1.—Rally of the Moselle Wines, organized by Aéro-Sport, in **Luxembourg.**

May 30-June 6.—R.A.F.A. Air Week, at **Brighton.** (Air display at Shoreham Airport, May 30.)

May 30-June 7.—Huit Jour d'Angers international gliding competition, organized by Aéro-Club de L'Ouest de la France, at **Angers.**

LONDON MOVE.—The Ransome and Marles Bearing Co. has moved its London office from Victoria Street to new premises at Cranmer House, 39 Brixton Road, S.W.9. (Telephone Reliance 6771 and telex 25237.)

Company Notices

NEW COMPANIES

Bostock Propellers, Ltd. (626,331).—Private co. Reg. April 21. Cap. £100 in £1 shs. Subscribers (each with one sh.): Jean Herbert, co. director, and Thomas A. Herbert, barrister, both of 156 Strand, London, W.C.2. Directors: James G. Bostock and Harry W. Lester. Sec.: Thomas A. Herbert. Reg. off.: 86 Old Castle Rd., Rodwell, Weymouth.

Butterworth Aero Engines, Ltd. (626,390).—Private co. Reg. April 22. Cap. £100 in £1 shs. Objects: To develop for commercial use in aircraft a British engine and to carry on the business of designers and manufacturers of such an engine and all types of aero engines and accessories, etc. Subscribers (each with one sh.): The Hon. Peter B. R. Vanneck, White Lodge, Waldringfield, Suffolk; N. Herbert Jones, The White House, Church Rd., Claygate, Surrey, co. director. First directors to be appointed by subscribers. Sec.: R. G. Carter. Reg. Off.: Grove Gardens, Frimley, nr. Aldershot.

Yorkshire Aeroplane Club, Ltd. (626,256).—Private co. Reg. April 20. Cap. £100 in £1 shs. Objects: To carry on the business of a flying and gliding club, and to carry on and perpetuate the objects and traditions of the original Yorkshire Aeroplane Club, etc. Directors: Frank Leach, "Montclare," Breary Lane, Bramhope, Leeds, director of Frank Leach Motors, Ltd., etc. Albert Barker, 44 Westgate, Shipley, Yorks, director of A. Barker (T.V.), Ltd. Sec.: F. Leach. Solrs.: Last and Reddihough, Bradford.

Yorkshire Light Aircraft, Ltd. (626,378).—Private co. Reg. April 21. Cap. £1,000 in £1 shs. Objects: To carry on the business of manufacturers of and dealers in, letters on hire, repairers, cleaners, storers of aeroplanes, etc. Directors: Samuel O. Whiteley, Slitheroe Bridge, Rishworth. Michael Rockliff, 133 Harrogate Road, Bradford, 2. Sec.: M. Rockliff. Solrs.: W. B. D. Shackleton, Bradford, 1. Reg. Off.: The Aerodrome, Yeadon, nr. Leeds.

New Patents

APPLICATIONS ACCEPTED

814,895.—Folland Aircraft, Ltd., and Petter, W. E. W.—"Aircraft armament."—July 23, 1956 (July 21, 1955).

815,137.—Sperry Rand Corporation.—"Flight path angle computers."—March 13, 1957 (March 13, 1956).

815,058.—Martin-Baker Aircraft Co., Ltd., and Martin, J.—"Seat ejection mechanisms for aircraft."—May 1, 1957 (June 7, 1956).

815,059.—Martin-Baker Aircraft Co., Ltd., and Martin, J.—"Time delayed firing mechanism for aircraft ejection seats."—May 1, 1957 (June 7, 1956). (Divided out of 815,058).

Applications open to public inspection on June 17, 1959; opposition period expires on Sept. 17, 1959.

Personal Notices

BIRTHS

Arnott.—On April 28, at R.A.F. Hospital, Nocton Hall, to Betty (*née* Walker), wife of Wg. Cdr. Athol Arnott, O.B.E., R.A.F.—a son.

Brittain.—On April 28, at Primrose Lane Hospital, Huntingdon, to Vi, wife of Flt. Lt. R. D. Brittain—a son.

Brown.—On April 26, at Louth Hospital, to Peta (*née* Christie), wife of Flt. Lt. Robin Brown—a daughter.

Chesworth.—On April 26, to Betty, wife of Flt. Lt. G. A. Chesworth, D.F.C., R.A.F.—a son.

Davidson.—On April 25, to Patricia (*née* Johnstone), wife of Flg. Off. Roland H. Davidson, R.A.F.—a daughter.

Gilbert.—On April 24, at R.A.F. Swinderby, to Patricia (*née* Smith), wife of Flt. Lt. G. H. Gilbert—a son.

Holmes.—On April 28, to Joan (*née* Hynes), wife of Flt. Lt. P. B. Holmes, R.A.F.—a son.

Jennings.—On April 23, at B.M.H. Hanover, to Mildred (*née* Lane), wife of Flt. Lt. D. R. Jennings, R.A.F.—a daughter

Lamond.—On April 27, to Nesta, wife of Wg. Cdr. H. W. Lamond, R.A.F.—a son.

Lunn.—On April 26, at R.A.F. Hospital, Nocton Hall, to Diana (*née* Broadhurst), wife of Flt. Lt. L. C. Lunn—a son.

Sheerin.—On May 1, in Nicosia, to Suzanne (*née* Le Roux), wife of Flg. Off. J. D. Sheerin, R.A.F.—a son.

DEATH

Edmonds.—On April 28, Wg. Cdr. D. W. Edmonds, O.B.E., D.F.C., A.F.C., R.A.F. (retd.).

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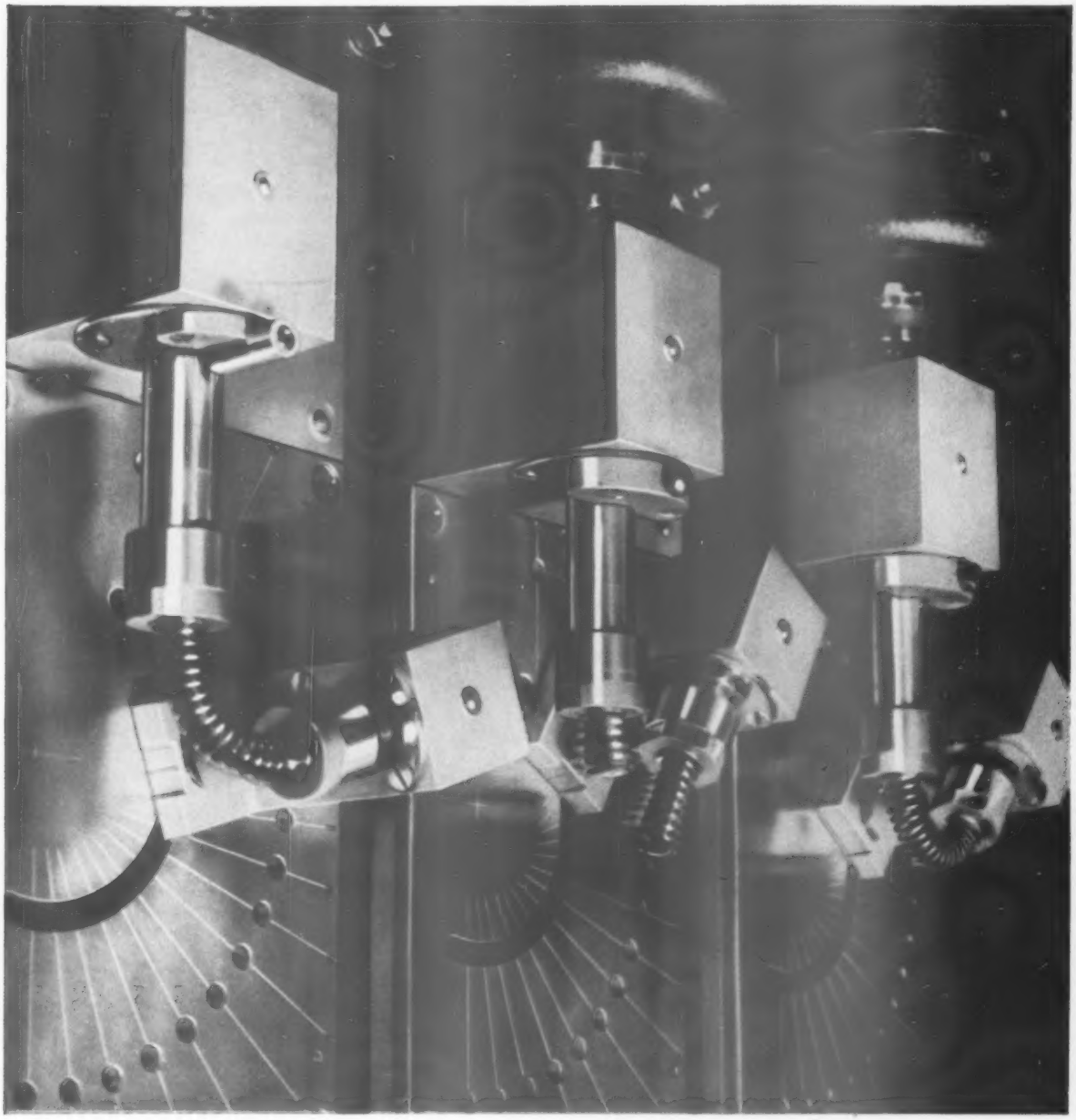

LUCAS COMPONENT TESTING

FATIGUE-TESTING OF SPRINGS for Lucas fuel systems is an example of the thoroughness of Lucas facilities for quality-control. Exhaustive testing and inspection is undertaken at every stage of manufacture.

These machines can stress springs to a very much greater degree than they will ever encounter in a fuel system.

This is one of many highly-developed facilities upon which Lucas efficiency has been based. It is a part of the unique service Lucas offers aircraft engine manufacturers.

Fuel and Combustion Systems for Gas Turbine Engines

JOSEPH LUCAS (GAS TURBINE EQUIPMENT) LTD., Birmingham & Burnley.
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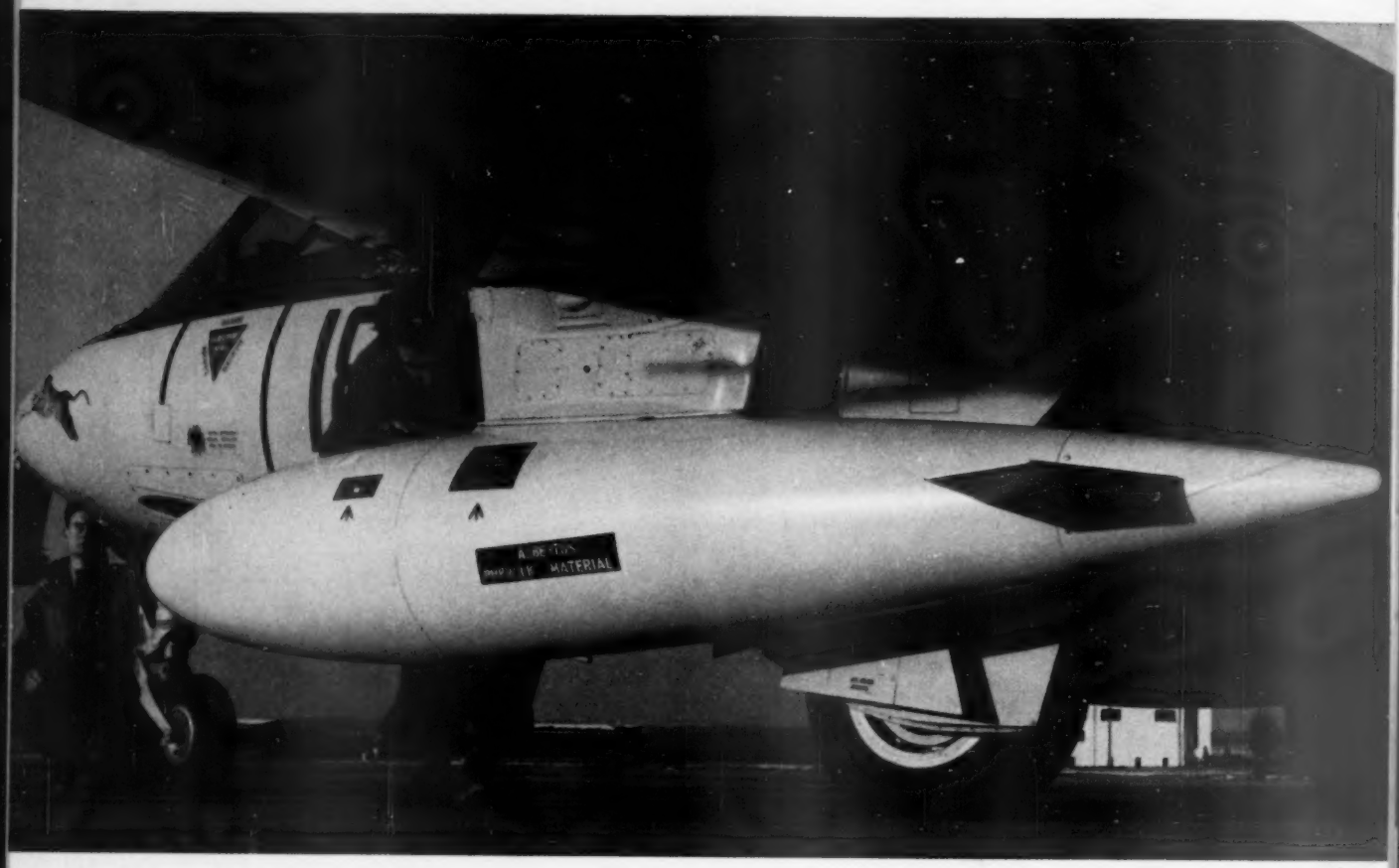
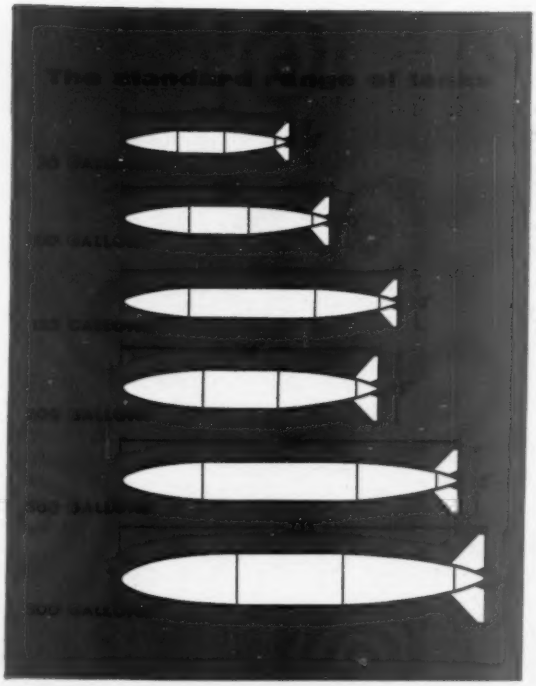


Not-so-expensive expendables

Today, drop-tanks are a major expendable in the operation of military aircraft. As most of them are of light alloy, semi-monocoque construction, they could, in time of war, compete directly with aircraft for labour, plant and strategic materials.

Bristol plastic drop-tanks were designed to avoid these difficulties. They are much easier to produce than their alloy equivalents and utilise plant and skills that would not be particularly scarce in wartime. Their aerodynamic superiority to alloy tanks has been proved at supersonic speeds and under combat conditions. They can be dismantled for compact stacking and are unaffected by extremes of temperature and humidity.

Plastic drop-tanks are currently being produced for 17 types of aircraft in service with the armed forces of 8 nations. These figures are still increasing and over 6,000 Bristol drop-tanks have so far been supplied. They are, furthermore, being built under licence in Holland, Belgium and France.



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